UPDATE #2

137910

ATTACHMENT

Record of Decision
Remedial Alternative Selection

SITE: Johns-Manville-Waukegan, Illinois Disposal Area

DOCUMENTS REVIEWED

I am basing my decision primarily on the following documents describing the analysis of cost-effectiveness of remedial alternatives for the Johns-Manville site:

- Johns-Manville Remedial Investigation
- Johns-Manville Feasibility Study and Addendum
- Summary of Remedial Alternative Selection
- Responsiveness Summary

A list of the remaining documents which comprise the administrative record is attached to this Record of Decision.

DESCRIPTION OF REMEDY

The major components of the selected remedy, soil covering with vegetation, are:

1. - waste materials/soil in the inactive waste disposal areas of the site will be graded and covered with 24 inches of compacted non-asbestos-containing soil (see Exhibit 1). The cover will consist of six inches of sand overlain by 12 inches of clay. Six inches of topsoil will be placed over the clay, and a vegetative cover will be grown and maintained.

2. - the asbestos disposal pit will be closed in June 1989 and provided with 24 inches of cover as described above.

3. - The miscellaneous disposal pit, sludge disposal pit, and wastewater treatment system will continue to operate; asbestos is no longer used in the manufacturing processes at the facility.

4. - any asbestos-containing material generated from reconstruction activities at the facility after June, 1989 will be disposed of off-site in an approved landfill.

5. - a soil cover monitoring program will be developed to ensure that no asbestos reaches the surface of the cover and becomes releasable to the air in the future.

6. - where feasible, one layer of nominal 12-inch thick riprap will be placed on the interior slopes of settling basins. Four-inch thick bedding material will be used to prevent erosion of soil beneath the riprap. All other exposed interior slopes will be provided with 24 inches of soil cover as described above.

7. - a contingency plan will be developed to ensure that no asbestos-containing sludge is dredged from the wastewater treatment system in the future.

8. - the north, west, and south slopes of the waste disposal area will be sloped with non-asbestos-containing soil to a ratio of two horizontal to one vertical and provided with 24 inches of soil cover with vegetation as previously described (see Exhibit 1).

9. - A minimum of 24 inches of non-asbestos-containing soil will be placed on top of all dikes and dike roadways on-site. In addition, heavily used dike roadways will be provided with eight inches of compacted gravel, and lightly travelled dike roadways with four inches of compacted gravel.

10. - A ground water and surface water detection monitoring system will be established on-site to ensure that any contaminants that leach from the site are detected. The monitoring and reporting of results to U.S. EPA will continue for a minimum of 30 years. A contingency plan will be developed to ensure that appropriate remedial action will be taken if contaminant concentrations that would pose a threat to public health and the environment are detected.

11. - An air monitoring program will be established at the waste disposal area to determine the levels of asbestos, lead, TSP, and chromium in the air around the site. The monitoring and reporting of results to U.S. EPA will continue for a minimum of 15 years after the initiation of on-site construction activities for the remedial action. A contingency plan will be developed to ensure that appropriate remedial action will be taken if contaminant levels exceed the applicable air standards or health-based criteria.

12. - debris from the beach and southwest portion of the waste disposal area will be cleaned up.

13. - the eastern site boundary will be fenced to limit access.

14. - additional warning signs will be placed along the site perimeter.

15. - the small ditch connected to the south end of the east ditch (see Exhibit 1) will be closed.

16. - the active waste disposal areas (miscellaneous disposal pit, sludge disposal pit, and wastewater treatment system) will be sampled to verify Manville's claims that no asbestos has been deposited in the miscellaneous disposal pit, no asbestos-containing sludge is near the surface of the sludge disposal pit, and no hazardous wastes are entering the wastewater treatment system.

17. - the open area in the northeast corner of the miscellaneous disposal pit (see Exhibit 1) will be closed.

18. - peripheral ditches will be constructed to collect site run-off and channel it to the industrial canal.

19. - dikes will be constructed at the depressed area along the north side of the industrial canal to prevent industrial canal water from migrating off-site.

DECLARATIONS

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the National Contingency Plan (40 CFR Part 300), I have determined that the soil covering with vegetation remedy at the Johns-Manville site is a cost-effective remedy and provides adequate protection to public health, welfare, and the environment. The State of Illinois has been consulted and agrees with the approved remedy. In addition, the action will require future operation and maintenance activities to ensure the continued effectiveness of the remedy. It is anticipated that these activities will be undertaken by the potentially responsible party, Manville.

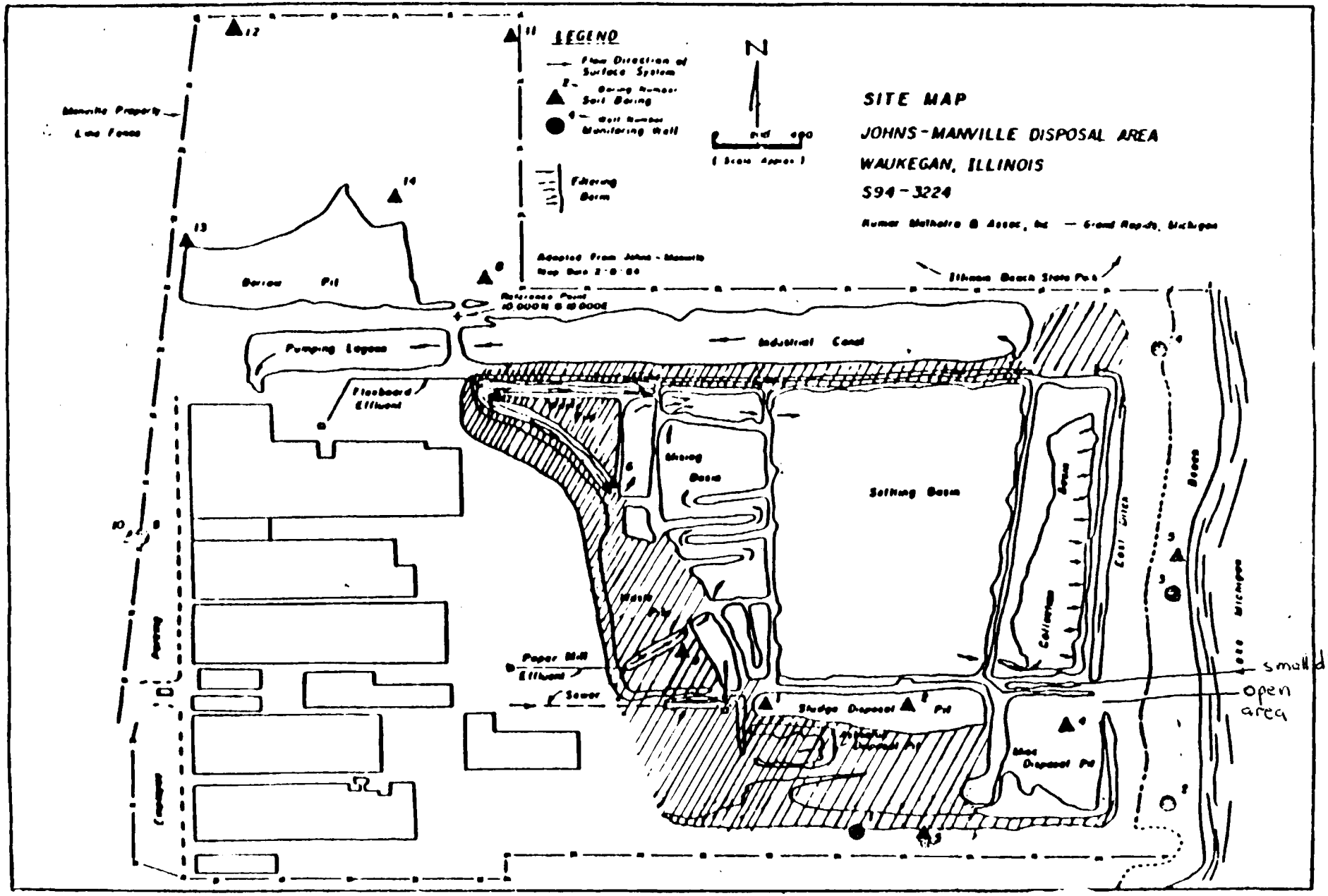
I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

6/30/87
Date

Valdas V. Adamkus
Regional Administrator

Exhibit 1

Site Areas to Which Soil Cover Will be Applied
(With Vegetation)
(Shaded)



SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
JOHNS-MANVILLE-WAUKEGAN DISPOSAL AREA

SITE LOCATION AND DESCRIPTION

The Johns-Manville-Waukegan, Illinois National Priorities List (NPL) site is located along Lake Michigan in east-central Lake County, at Greenwood Avenue in the city of Waukegan in northeastern Illinois (southern half of Section 10, Township 45N, Range 12E). Refer to Figures I and II.

The disposal area, or site, covers approximately 120 acres of the approximately 300 acres of land owned by the Manville Service Corporation (Manville), formerly the Johns-Manville Sales Corporation. The site is bordered on the east by Lake Michigan, on the north by Illinois Beach State Park, on the south by an electrical generating station, and on the west by the Manville manufacturing buildings and an old city dump site. There are no residential dwellings within one-half mile of the site, and approximately 200 homes within one mile of the western edge of the site. The site is located along the eastern edge of the City of Waukegan, which had a population of 67,650, according to the 1980 census.

The entire site is elevated with respect to the surrounding land area, which is a flat, gently sloping marsh. The maximum elevation of the site is approximately 40 feet above natural ground. The surface topography of the site is irregular. Refer to Figure III. In general, the outer portions of the waste disposal area slope away from the center of the site. Parts of the southern portion of the site slope into closed depressions, such as the asbestos disposal pit, sludge disposal pit, and miscellaneous disposal pit. The southwestern portion of the site slopes toward the west, and the eastern portion of the site slopes gradually downward toward Lake Michigan. Surface runoff at the site flows into the various ponds of the wastewater treatment system and the disposal pits on-site and to Lake Michigan. An intermittent flow creek starts approximately 3000 feet north of the site and flows northeast to the Dead River, which discharges to Lake Michigan.

There are five major groundwater aquifers in Lake County: the glacial drift aquifers, the shallow dolomite aquifer (Silurian), the Glenwood-St. Peter Sandstone, the Ironton-Galesville Sandstone, and the Mount Simon Sandstone. The glacial drift aquifers range from 15 to 50 feet in depth and often contain sufficient ground water to supply household needs. The Silurian dolomite aquifer is productive, but water quality can be poor due to oil, gas, or hydrogen sulfide of ecological origin. The Galesville Sandstone aquifer is the most productive of the deep sandstone aquifers. It generally produces 1000 or more gallons per minute. The St. Peter Sandstone produces moderate quantities of water, and the Mt. Simon Sandstone aquifer has the potential to produce large quantities of water but is not generally used because of its great depth and the high salinity of the water contained within it.

SITE HISTORY

The Manville plant presently produces and has produced a wide range of building materials. Waste materials containing primarily asbestos, and to a lesser extent, lead, chrome, thiram, and xylene have been deposited at the site since about 1922. Other contaminants, including methanol, naptha, toluene, mineral spirits, various acids, fuels, and pesticides, have been disposed of at the site; however, these additional contaminants have not been identified as being disposed of in considerable quantities at the site. Presently, no asbestos or lead is used in manufacturing processes and is, therefore, no longer deposited on-site, with the exception of friable asbestos from reconstruction (non-manufacturing) activities in the manufacturing buildings.

Wastes have been deposited in a variety of pits at the site, many of wnich are no longer in use. The active waste disposal pits are the asbestos disposal pit, which receives friable asbestos wastes from manufacturing building reconstruction activities, the sludge disposal pit, which receives dredged materials from the wastewater treatment system, and the miscellaneous disposal pit, in which miscellaneous, non-asbestos-containing wastes are and were deposited. The Manville facility's wastewater treatment system is also located on the site. Fibrous materials in the facility's wastewater are settled out over time in the series of unlined ponds and waterways which comprise the wastewater treatment system. The deposited materials are periodically dredged and transported to and deposited in the sludge disposal pit. In addition, waste matrials presently comprise the north, south, and most of the western site slopes, or boundaries.

A permit was issued in 1973 by the State of Illinois for process wastewater management using a closed-loop recycle system. To date, there have been no documented violations of this permit. Airborne asbestos monitoring was conducted at the site in 1973 and 1982 by the Illinois Institute of Technology Research Institute and the U.S. EPA Field Investigation Team, respectively. The 1973 study did not provide conclusive evidence of asbestos air contamination, and the 1982 study indicated that concentrations of asbestos fibers in the 2.5 to 15 micrometer range were elevated on-site and downwind of the site and concentrations of asbestos fibers less than 2.5 micrometers were elevated on-site. The site was listed on the NPL in December 1982.

CURRENT SITE STATUS

The Remedial Investigation (RI) for the Johns-Manville site consisted of air, groundwater, soil, and Lake Michigan water sampling programs.

The asbestos air investigation consisted of five on-site and three off-site sampling locations. The on-site sampling locations are indicated on Figure IV. Two of the three offsite locations were west of the site, within two miles, and the third was located approximately three miles northwest of the site. Five rounds of sampling were conducted, and the results indicated that there were elevated levels of asbestos fibers on-site. Results are indicated in Table I. Subsequent to the RI, an ambient air quality survey for lead and total suspended particulates (TSP) was conducted for Manville by Clayton Environmental Consultants, Inc. Three rounds of sampling were con-

ducted at eight on-site and two off-site sampling locations. Sampling locations are shown on Figures IV and V, and results are indicated in Table II. Levels of TSP exceeded the primary National Ambient Air Quality Standards (NAAQS, annual geometric mean) on one occasion and the secondary NAAQS (annual geometric mean) on three occasions. More data would be required (a minumum of five daily readings per calendar quarter) to determine whether an actual exceedance of the TSP NAAQS occurred at the site; however, the study indicated that there is a potential particulate problem on-site. Lead levels were well within the lead NAAQS (3-month average) during the sampling. Again, further data would be required to verify compliance or noncompliance with the lead NAAQS at at the site. No analyses were performed for chromium or any organic contaminants.

Five ground water monitoring wells were installed on-site, and, for asbestos sampling, four surface water sampling locations were established in Lake Michigan. Refer to Figure VI for the locations. One round of sampling was conducted. The results indicated that the ground water at the site flows to the east and the northeast (see arrows on Figure VI). Results of the ground water analyses are presented in Table III. Due to the number and locations of the monitoring wells and the performance of single round of sampling, the conclusions based upon these investigations are questionable. Arsenic was detected in quantities greater than the applicable health-based water quality criteria during the single round of sampling. It should be noted that, based on the materials known to be disposed of on-site, arsenic may not be attributable to the site. Analyses for asbestos were conducted in both ground water samples and Lake Michigan water samples using transmission electron microscopy. Only one round of sampling was conducted, again rendering conclusions questionable. Asbestos fiber concentrations exceeded applicable health based water quality criteria at all ground water and surface water sampling locations. Results of the ground water and Lake Michigan water asbestos analyses are presented in Table IV.

Fourteen soil borings were performed to determine the physical nature of the soils in the waste disposal area and the soils in the borrow pit area northwest of the site (refer to Figure VI for locations). Thirty-one samples from the borings were analyzed; results indicated that elevated levels of lead are contained in on-site soils. Detectable levels of other metals, most notably chromium, are also present. Results of the soil analyses are indicated in Table V.

The Remedial Investigation indicated the need to take action to prevent releases of asbestos and TSP into the air and ensure that arsenic (if appropriate) and asbestos are effectively remediated in site ground water and Lake Michigan surface waters near the site. There is also a need for further air, ground water, and surface water monitoring at the site and a mechanism for remediation of any contaminants that are detected in concentrations that would present an endangerment to public health and the environment.

Based on the results of the RI, the primary contaminants of concern at the site are asbestos, lead, chromium, particulate matter, and, potentially, arsenic. Further monitoring may identify additional contaminants of concern. Asbestos in the air is a known lung carcinogen and can also cause a number of other serious diseases, including asbestosis, a chronic disease of the lungs which makes breathing increasingly difficult and may cause death, and mesothelioma, a cancer of the membranes that line the chest and abdomen which is nearly always fatal. Cancers can occur from 15 to 40 years after the first esposure. No safe limit of exposure is known, and any exposure to asbestos carries some health risk. Lead is a reproductive toxin and can adversely affect the brain and central nervous system by causing encephalopathy and peripheral neuropathy. Exposure to lead can cause kidney damage and anemia, and chronic exposure to low levels of lead can cause subtle learning disabilities in children. There is also some evidence that some lead salts may be carcinogenic. Hexavalent chromium (Cr VI) causes kidney damage, and some evidence suggests that it may be a carcinogen. Trivalent chromium (Cr III) is much less toxic and can cause contact dermatitis in sensitive individuals. The analyses performed for the RI did not indicate the valence state of the chromium detected, so it is not clear what percentage of the chromium detected in the soils is hexavalent and what percentage is trivalent. Particulate matter (TSP) exposure results in bronchorestriction and causes respiratory problems. Arsenic has been associated with lung and skin cancer in humans and can cause skin lesions, peripheral vascular disease, and peripheral neuropathy.

Contaminant pathways and potential receptors associated with the site are summarized in Tables VI and VII, respectively.

ENFORCEMENT ANALYSIS

The Enforcement Analysis is included in this document as Appendix I.

ALTERNATIVES EVALUATION

The public health and environmental objectives used for the evaluation of alternatives were to ensure that: 1) the potential for releases of asbestos and other contaminants to the air is essentially eliminated, 2) direct contact with waste materials and soils is minimized or eliminated, 3) concentrations of any contaminants in the ground water exceeding applicable drinking water standards, health-based standards, or water quality criteria for aquatic life are detected and effectively remediated, and 4) no surface water leaves the site.

Considering the nature of the contaminants involved and the condition of the site, of all possible remedial action alternatives, the following alternatives were considered feasible and were evaluated in the Feasibility Study for the site:

ALTERNATIVE	SOURCE CONTROL OR MANAGEMENT OF MIGRATION
1. No Action	Neither
2. Soil Covering	Source Control
3. Capping	Source Control

4.	On-site Treatment/Stabilization	Source Control
5.	On-site Disposal/Landfilling	Source Control
6.	Off-site Disposal/Landfilling	Source Control

The alternatives were subjected to an initial screening process based on technical performance, including the ability to satisfy environmental standards, comparative costs, implementability, risk, reliability, and potential environmental impacts including safety. It was indicated that on-site stabilization is technically impractical due to the chemically inert and non-combustible nature of asbestos and involves high risks in its implementation; therefore, on-site stabilization was excluded from further consideration for the site. Soil covering with and without vegetation and capping all provide a similar degree of protection from airborne asbestos, which is of primary concern at the site. These alternatives also provide protection from direct contact with waste materials and soil and a barrier from infiltration, thus providing some degree of ground water protection. Capping offers greater protection to the ground water than the two soil covering variations; however, since groundwater contamination is not of primary concern at the site and capping costs approximately twice as much as the soil covering alternatives, capping was excluded from further consideration for the site. Similarly, the soil covering without vegetation alternative was excluded from further consideration because, for nearly the same cost, the soil covering with vegetation provides greater protection to public health and the environment due to the erosion control and stability offered by the vegetation. An alternative which does not achieve applicable standards, grading and seeding, was added to the list of alternatives for detailed development; thus, the alternatives considered for detailed development were:

ALTERNATIVE	SPECIFIC ACTIONS COMPRISING THE ALTERNATIVE
I. No Action	a. leaving the waste materials/soils on the disposal area in their present state. b. ground water detection monitoring system c. development of a contingency plan for ground water/surface water contamination.
II. Grading and Seeding	a. grading of waste materials/soils and establishing vegetation b. closure of the asbestos disposal pit. c. placement of riprap or grading and seeding interior slopes of settling basins of the wastewater treatment system d. development of a contingency plan for sludge disposal e. placement of soil and gravel on dikes and dike roadways f. ground water detection monitoring system

	g. development of a contingency plan for ground water/surface water contamination
	h. miscellaneous actions (listed on page 14)
III. Soil Covering with Vegetation	a. covering waste materials/soils with clean soil and establishing vegetation
	b. same as above
	c. placement of riprap or covering interior slopes of settling basins with clean soil and establishing vegetation
	d.- h. same as above
	k. development of a soil cover monitoring/ maintenance program
	l. sloping and covering side slopes of the waste disposal area with clean soil and establishing vegetation
IV. On-site Landfilling	a. removal and disposal of all waste materials/ soils in an on-site landfill designed specifically for these wastes, including installation of a multi-layer liner, placing a multi-layered cap for closure, and collection and treatment of leachate and runoff.
	b. ground water detection monitoring system
	c. development of a contingency plan for ground water/surface water contamination
V. Off-site Landfilling	a. removal and disposal of all waste materials/ soils in a compliant, off-site landfill
	b.-c. same as above

The five remaining alternatives underwent a detailed analysis, in which each alternative was evaluated for technical feasibility, institutional requirements, public health and environmental impacts, capital costs, and operation and maintenance (O&M) costs. In each case, the performance period for O&M costs used to calculate present worth costs was 30 years.

The no action alternative (Alternative I) has the least capital and O&M costs of the alternatives. It involves adverse impacts to public health and the environment by allowing the site to remain in its present state. This alternative does not meet the National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements for inactive asbestos disposal sites and the remedial response objectives and requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA or "Superfund"), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). No action also allows asbestos and arsenic levels to exceed applicable health-based water quality criteria and does not provide the additional data needed to thoroughly characterize TSP and lead air emissions and ground water and surface water quality at the site. This alternative costs $326,000 (present worth) and involves an estimated capital costs of $15,000 and annual operation and maintenance costs of $33,000.

The grading and seeding alternative (Alternative II) is technically feasible and would diminisn the immediate potential for the release of asbestos to the air and direct contact with waste materials and soil containing asbestos, lead, and other contaminants and would reduce TSP, lead, and other air emissions. This alternative would provide poor ground water protection, may not meet ground water and surface water standards and health-based criteria, and would not comply with the NESHAP requirements for asbestos disposal sites. The potential for human and wildlife exposure to asbestos fibers and lead may continue to exist, and this remedy would not provide long-term protection against releases of asbestos fibers to the air and, therefore, potential deposition of asbestos fibers in Lake Michigan. The alternative would, therefore, not meet the remedial response response objectives and requirements of CERCLA and SARA. Construction activities involved with this alternative may generate air levels of asbestos and other contaminants which may have an adverse impact on public health and the environment. The grading and seeding alternative costs $3,124,000 (present worth) and involves an estimated cost of $2,615,000 and annual O&M costs of $54,000.

Soil covering with vegetation (Alternative III) uses readily available and proven technology and is expected to eliminate releases of asbestos to the air, significantly reduce TSP, lead, and other air emissions, and eliminate the potential for direct contact with waste materials and soils containing asbestos, lead and other contaminants. This alternative meets NESHAP requirements for asbestos disposal pits as well as the remedial response objectives of CERCLA. With the inclusion of a cover monitoring program, the remedy also meets the SARA preference for permanent remedies. This alternative would also provide some degree of protection to the ground water from potential contamination from leachable contaminants, primarily lead. The reason for this is that the clayey silt proposed for use in the cover would act as a barrier to percolation of water down to and through the waste materials. Construction activities associated with this remedy may cause short-term adverse impacts to public health and the environment. The soil covering alternative costs $4,488,000 (present worth) and involves an estimated capital cost of $4,026,000 and annual O&M costs of $49,000.

The on-site landfilling alternative (Alternative IV) is technically feasible. It would involve the excavation and transport of large quantities of waste materials and would thus involve a high potential for releases of asbestos and other contaminants to the air. This remedy has the longest implementation time of all of the alternatives; thus the potential short-term adverse impact to public health and the environment resulting from construction activities would exist for a longer period of time with this alternative. In the long term, on-site landfilling would be expected to provide adequate protection to public health and the environment in the site vicinity, including groundwater protection. Adjacent land would be used for this alternative, creating a potential impact on the biological environment in the area. The on-site landfilling alternative costs $39,309,000 (present worth) and involves an estimated capital cost of $38,555,000 and annual O&M costs of $80,000.

The off-site landfilling alternative (Alternative V) uses readily available and proven technology. It relies on the available landfill capacity of existing landfills in the Waukegan area, which may be limited. In the long-term, this alternative would provide adequate protection to public health and the environment in the vicinity of the site. It would also provide protection to the ground water from leachable contaminants. More land along the Lake Michigan shore would be made available by this alternative. In the short term, off-site landfilling involves extensive excavation and transport of waste materials and would thus involve a high potential for the release of asbestos and other contaminants to the air. There would also be the added risks of transportation accidents on the way to the landfill. The cost of the off-site landfilling alternative is $73,393,000 (present worth), including an estimated capital cost of $70,565,000 and annual O&M costs of $300,000.

COMMUNITY RELATIONS

Limited concern was expressed about the Johns-Manville Site during the RI/FS. A public comment period was held in the summer of 1984 when the Consent Order for the RI/FS was issued. Two comments were received.

Approximately 20 people attended the public meeting held in February, 1987 to describe the results of the RI/FS and to accept public comments on the recommended alternatives.

Ten individuals and organizations submitted verbal or written comments during the public comment period. The International Chemical Workers Union, Local No. 60, the Lake County Health Department, and the League of Women Voters (Waukegan-Zion and Lake County Chapters) expressed support for U.S. EPA's recommended alternative. The Manville Sales Corporation submitted comments disagreeing with the proposed cover thickness. Other commenters expressed concern or asked questions about a variety of issues, including funding for a cleanup, use of the property after cleanup, and the degree of endangerment and and public health effects presented by the site. The comments received and U.S. EPA's response to them are detailed in Appendix II. Basically, an air monitoring program and associated contingency plan and a sampling plan for active waste disposal areas on-site were added to the recommended alternative in response to comments received during the public comment period.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

A list of applicable laws and the compliance status of each alternative with said laws is provided below:

CLEAN AIR ACT - The NESHAP requirements established under the Clean Air Act for inactive waste disposal sites for asbestos mills and manufacturing and fabrication operations are located at 40 CFR 61.153 and apply to the alternatives considered for this site. NESHAP requires no visible emissions or one of the following, to be placed over asbestos-containing materials:

1. six inches of compacted, non-asbestos-containing material/ soil cover, with vegetation, or

2. two feet of compacted, non-asbestos-containing material/ soil cover, to be maintained to prevent exposure of asbestos-containing materials to the atmosphere.

Alternatives III, IV, and V would comply with these requirements, and Alternatives I and II would not.

The Clean Air Act also established primary (public health) and secondary (welfare) National Ambient Air Quality Standards (NAAQS) for criteria pollutants, of which lead and total suspended particulates (TSP) are two. During the RI, lead levels on-site were well within the NAAQS, and TSP levels exceeded the primary NAAQS for TSP (annual geometric mean) on one occasion and the secondary NAAQS for TSP (annual geometric mean) on three occasions; however, additional data would be required to satisfy the requirements for determining compliance with the annual geometric mean TSP standards. It should be noted that TSP standards will soon be replaced by standards for particulate matter with a mean diameter under 10 microns (PM_{10}), thus, any requirements for monitoring for TSP in any of the recommended alternatives should be adjusted to incorporate the PM_{10} standards, when promulgated. With the exception of Alternative I, in which ambient levels of lead and TSP would not be expected to change, it is difficult to determine whether the alternatives will exceed the NAAQS during implementation. Proper controls, such as dust suppression activities, will be practiced with Alternatives II - V. Since Alternatives II and III involve less construction and no excavation activities, the amount of dust and airborne contamination generated during implementation of these alternatives would be significantly less than that for Alternatives IV and V, which involve disturbing, excavating, and transporting large quantities of waste material. In the long term, Alternatives II-V would reduce ambient levels of lead and TSP. Providing a covering layer and vegetation will reduce airborne dispersion of contaminants. Since all waste materials would be removed from the disposal area, Alternatives IV and V would be more effective in reducing ambient levels of lead and TSP than Alternatives II and III, in which two dry disposal areas (sludge disposal pit and miscellaneous disposal pit) will remain active.

CERCLA/NCP

The National Contingency Plan, 40 CFR Part 300 (NCP), as adopted by CERCLA, requires that a remedial response alternative must mitigate releases or threats of releases of contaminants which may present an imminent and substantial endangerment to public health and welfare. The remedial response objectives at this site are to mitigate releases of asbestos and other contaminants to the air, direct contact with contaminated soils and surface water, and ground water contamination. Alternative I does not meet this objective. In the short term, the potential health effects of the construction activities

for the landfilling and, to a lesser extent, the soil covering alternatives may not meet the CERCLA objective. However, the impacts of these activities can be greatly reduced through various dust suppression techniques during construction. In addition, the provisions of SARA must be considered, including the Section 121 cleanup standards, which states a preference for permanent remedies. It should be noted that, since asbestos cannot be combusted and is essentially chemically inert, a permanent remedy cannot be effectively implemented at this site. The on-site treatment/ stabilization alternative eliminated in the preliminary screening step is an alternative which could be defined as a permanent remedy; however, this alternative was excluded from further consideration for the reasons stated above. Alternatives III-V would provide long-term protection to public health and the environment from releases of asbestos and other contaminants to the air and direct contact with waste materials and soil. Due to the minimal thickness of cover involved in Alternative II and the fact that, in frost-susceptible areas, stones and other large particles, such as broken scraps of asbestos, tend to move differentially upward through the soil with each freeze/ thaw cycle, Alternative II provides only short-term protection from releases of asbestos and direct contact with waste materials and soil. For this reason, Alternative II does not meet the objectives of SARA. Due to the inclusion of the ground water and surface water detection monitoring system and associated contingency plan, all alternatives would be expected to achieve the CERCLA remedial response objectives for mitigation of potential ground water contamination. In the long term, alternatives III-V would be expected to effectively reduce asbestos levels in Lake Michigan by eliminating airborne deposition of asbestos.

CLEAN WATER ACT (CWA)

In the site's present condition, there are no apparent point source discharges to waters of the United States (Lake Michigan). None of the alternatives will require a point source wastewater discharge, and alternatives II-V will include steps to eliminate any surface runoff.

Ground water monitoring requirements will be established under Alternatives I-IV that are sufficient to define the concentration and flux to Lake Michigan of contaminants from the site. The ground water remedial contingency plan to be established along with the ground water monitoring requirements will include contaminant trigger levels to protect surface water quality in Lake Michigan or any other surface water receptor. These trigger levels will be established with the assistance of the Illinois Environmental Protection Agency (IEPA) Division of Water Pollution Control and U.S. EPA Water Division to ensure that applicable Illinois water quality standards (WQS) or U.S. EPA ambient water quality criteria are not exceeded at any point in the surface waters.

If it becomes necessary to initiate any ground water remedial actions or other remedial actions that involve an off-site surface water discharge, an NPDES permit will be obtained prior to any discharge. Any discharges to a publicly owned treatment works (POTW) will comply with all applicable pretreatment requirements, as defined by the POTW, IEPA, and/ or U.S. EPA.

The above conditions will ensure compliance of the remedial actions (Alternatives II-V) with the wastewater discharge requirements of the CWA, as amended by the Water Quality Act of 1987 (WQA).

During the single round of RI sampling, arsenic levels in the ground water and asbestos levels in the ground water and Lake Michigan exceeded U.S. EPA ambient water quality criteria for the protection of human health at the 10^{-6} risk level for cancer. Based on the IEPA's draft narrative toxics criteria, the asbestos levels violated Illinois water quality standards for general use and public water supply. In this respect, the site is not currently meeting the requirements of the CWA. It should again be noted that arsenic may not be attributable to the site. Additionally, considering the fact that, due to its shape and chemically inert nature, asbestos essentially does not move through the ground water, the asbestos levels in the ground water wells were unusually high. These high levels were probably due to the very close proximity of the wells to Lake Michigan. Therefore, the asbestos levels detected in these wells are probably indicative of Lake Michigan asbestos levels rather than asbestos migration through the ground water beneath the site. The monitoring network that comprises the ground water and surface water detection monitoring system included in all five alternatives will be established to allow a determination of whether the high arsenic levels are attributable to the site or are resulting from an upgradient source. Alternatives III-V, and to a much lesser extent, Alternative II, are expected to lower asbestos levels in Lake Michigan by reducing asbestos levels in air and, thus, airborne asbestos deposition into Lake Michigan. This will be an important step in achieving compliance with water quality standards and criteria for asbestos in the Lake. The ground water/surface water contingency plan to be developed as part of all five alternatives will ensure that appropriate remedial action will be taken if the actions that comprise the difference alternatives are not effective in reducing contaminant concentrations to levels that comply with applicable water quality standards and criteria.

SAFE DRINKING WATER ACT (SDWA), GREAT LAKES WATER QUALITY AGREEMENT OF 1978 (GLWQA), and U.S. EPA GROUND WATER PROTECTION STRATEGY (GWPS)

It is not known, based upon the results of the RI, whether Manville is in compliance with the terms of the GLWQA regarding control of inputs of persistent toxic substances to the Great Lakes. It is also not clear whether ground water discharging from the site to Lake Michigan is in violation of water quality criteria for the protection of aquatic life. The ground water and surface water detection monitoring system will provide the additional data needed to determine whether the site and nearby Lake Michigan waters comply with the requirements of the above water acts, agreements, and strategies, and the associated ground water/surface water contingency plan will provide appropriate remedial action in the event that compliance is not achieved.

It should be noted that the landfilling Alternatives (IV and V) provide a greater degree of resistance to percolation and, therefore, a greater degree of ground water protection than the soil covering Alternatives (II and III) and the no action Alternative (I).

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

RCRA has specific requirements, 40 CFR Part 257, for siting and operating solid waste disposal facilities. All alternatives comply with all applicable requirements of RCRA. Again, it should be noted that, due to the use of impermeable liners, the landfilling alternatives (IV and V) offer a greater degree of ground water protection and are therefore preferable over the other alternatives from a RCRA standpoint.

OCCUPATIONAL SAFETY AND HEALTH ACT - (OSHA)

Regulations apply to the safety of workers during the implementation of the alternatives. All alternatives consider worker exposure to contaminants and are expected to comply with OSHA requirements. Due to the longer implementation times and the greater quantities of waste material to be handled, the landfilling alternatives (IV and V) would require a greater period of personal air monitoring and protection.

STATE OF ILLINOIS REQUIREMENTS

The State of Illinois has been delegated the authority to enforce the NESHAP regulations, including those listed above for asbestos. The only other State requirement applicable to this site, State of Illinois Environmental Protection Rules and Regulations, Part 807, Subpart C, Section 807.305 is an applicable, relevant, and appropriate requirement (ARAR) for this site and requires that a compacted layer of not less than two feet of suitable material be placed over the inactive areas of the waste disposal area. There are also State of Illinois draft design criteria for waste management facilities which establish a requirement for growth and maintenance of a vegetative cover and specify soil composition and slope requirements for cover. Alternatives I and II would not comply with this ARAR or the draft design criteria. Alternative III would comply with the ARAR, but not the draft design criteria for soil composition. It is not clear whether Alternative IV, as described in the FS Report (30 mil thick PVC membrane overlain by 12 inches of topsoil), would comply with either the ARAR or the design criteria. Alternative V would be expected to comply with the ARAR and the design criteria.

RECOMMENDED ALTERNATIVE

The recommended alternative is a multi-faceted approach for remediating the site. The waste materials/soil in the shaded areas in Figure VII will be graded and covered with 24 inches of compacted non-asbestos - containing soil. The profile of the 24 inch covering layer is shown in Figure VIII and consists of six inches of sandy material obtained from the borrow pit on-site, twelve inches of clay from an off-site source, and six inches of top soil. All cover materials will be tested for asbestos prior to placement; any soils containing asbestos will be rejected. A cover of vegetation will be grown and maintained at the top of the covering layer. The three active waste disposal areas (the miscellaneous disposal pit, the sludge disposal pit, and the asbestos disposal pit) will continue to receive waste materials in the future; however, the asbestos disposal pit will be closed in June 1989 and provided with 24 inches of cover as described above. Asbestos-containing waste materials disposed of prior to closure of the asbestos pit will be disposed of in accordance with the NESHAP requirements located at 40 CFR 61.156, and any asbestos-containing waste material generated after June 1989

will be disposed of off-site in an approved landfill. A soil cover monitoring/maintenance program will be developed to ensure that no asbestos reaches the surface of the covering layer and becomes releasable to the air in the future.

Where it is feasible to place riprap, one layer of nominal 12-inch thick riprap will be placed on the interior slopes of settling basins. Four-inch thick bedding material will be used to prevent erosion of soil underneath the riprap. All other exposed interior slopes will be provided with 24 inches of soil cover with vegetation as previously described. A plan will be developed to ensure that no asbestos-containing sludge is dredged from the wastewater treatment system in the future and disposed of on-site. This plan will include the discontinuance of dredging activities in the 33-acre settling basin and dredging all waterways leading to the settling basin to a depth that exceeds the depth range of Manville's dredging equipment. The sludge generated from this deep dredging will be deposited in the asbestos disposal pit and covered with soil in accordance with NESHAP requirements. Since no asbestos is presently used in manufacturing activities at Manville and is, therefore, no longer deposited in the wastewater treatment system, these measures will ensure that no asbestos-containing sludge is dredged in the future. The remaining waterways of the system (the collection basin and the east ditch) do not contain any sludge since the natural earth dam between the settling basin and the collection basin filters out any fibrous materials from the wastewater. If, for any reason, sludge is removed from the settling basin in the future, it will be tested for asbestos and other contaminants of concern using U.S. EPA approved methods and disposed of accordingly.

The north, west, and south side slopes of the waste disposal area will be sloped with non-asbestos-containing soil to a ratio of two horizontal to one vertical and provided with 24 inches of soil cover with vegetation as previously described (see Figure VII).

A minimum of 24 inches of non-asbestos-containing soil will be placed on top of all dikes and dike roadways on-site. In addition, heavily used dike roadways will be provided with eight inches of compacted gravel, and lightly traveled dike roadways with four inches of compacted gravel.

A ground water and surface water detection monitoring system will be established on-site to ensure that any contaminants that leach from the site are detected. This system will consist of a minimum of twelve monitoring wells and three surface water sampling locations (i.e., locations for sampling ground water seepage to Lake Michigan). See Figure IX for the suggested locations of the monitoring wells and surface water sampling stations. The wells and surface waters will be installed prior to the commencement of on-site construction and will be sampled quarterly for a minimum period of two years and bi-annually then after and analyzed for asbestos, lead, chromium, arsenic, and other organic and inorganic water quality parameters which can be attributed to waste disposal practices at the site. The list of parameters will be established based on a source characterization that will be conducted by U.S. EPA prior to the commencement of remedial action at the site. At least one round of samples will be collected prior to the commencement of remedial action construction activities.

The monitoring and reporting of the results to U.S. EPA will continue for a minimum of 30 years. At that time, the need for further monitoring will be evaluated, and appropriate action will be taken. A contingency plan will be developed to ensure that appropriate remedial action will be taken if contaminant concentrations that would pose or, in the case of asbestos and, potentially, arsenic, continue to pose a threat to public health and the environment are detected.

An air monitoring program will be established at the waste disposal area to determine the levels of asbestos, lead, TSP, and chromium in the air (chromium was added since it is expected to soon be added to the list of air contaminants regulated under the Clean Air Act), generate the additional data needed to determine whether the site attains the lead and TSP NAAQS, and determine whether the remedy is effective in reducing on-site TSP levels and airborne asbestos deposition into Lake Michigan. A sufficient number of monitoring stations will be employed to ensure that background, on-site, and downwind air quality is thoroughly characterized. Beginning with the initiation of on-site construction activities, analyses for lead, chromium, and TSP (PM_{10}) will be performed quarterly for a period of five years, and analyses for asbestos will be performed annually for a period five years. Based on the results of these analyses, the appropriate time interval for further monitoring for the above-listed contaminants will be determined. At a minimum, monitoring will be conducted for a period of 10 years after this determination; at that time, the need for further monitoring will be evaluated, and appropriate action will be taken. A contingency plan will be developed to ensure that appropriate remedial action will be taken if contaminant levels exceed the applicable air standards or health-based criteria.

The recommended alternative includes a number of miscellaneous actions, which are summarized below:

1) cleanup of debris from the beach and the southwest portion of the waste disposal area,

2) fencing the eastern site boundary to limit access,

3) placement of additional warning signs along the site perimeter,

4) closure of the open area in the northeast corner of the miscellaneous disposal pit (see Figure VII) to prevent runoff,

5) construction of peripheral ditches to collect site runoff and channel it to the industrial canal,

6) construction of dikes at the depressed area along the north side of the industrial canal to prevent industrial canal water from migrating off-site,

7) closure of the small ditch connected to the south end of the east ditch (see Figure VII), and

8) sampling of the active disposal areas (miscellaneous disposal pit, sludge disposal pit, and wastewater treatment system) to verify that no asbestos has been deposited in the miscella-

neous disposal pit, that no asbestos-containing sludge is at or near the surface of the sludge disposal pit, and that no hazardous wastes are entering the wastewater treatment system.

The recommended alternative exceeds the requirements of NESHAP since more than six inches of compacted non-asbestos-containing material/soil cover, with vegetation, will be placed over the waste materials of the inactive waste disposal areas on the site. Based on the RI data, the site presently achieves the NAAQS for lead, and the recommended alternative will further reduce lead levels in air. Additional data is needed to determine whether TSP levels exceeded the NAAQS for TSP (annual geometric mean); the monitoring done during the RI indicated that TSP levels exceeded the primary NAAQS geometric mean value on one occasion and the secondary value on three occasions. Once implemented, it is expected that the recommended alternative will reduce on-site TSP concentrations to levels that attain the NAAQS; the air monitoring program described below will generate data to track the attainment status of the site with the TSP and lead NAAQS. The initial grading and construction activities involved with the alternative could potentially generate lead and particulate levels in the air that would exceed the NAAQS (24 hour maximum for TSP, and three month average for lead). Dust suppression methods will be employed throughout the construction activities to minimize the amount of dust and airborne contaminants that are released, and monitoring for asbestos, lead, chromium, and TSP will be performed to characterize concentrations of these contaminants during construction activities and for a minimum of thirteen years thereafter. The contingency plan that will be developed will ensure that appropriate remedial action will be taken if contaminant levels exceed the applicable air standards or health-based criteria.

The remedial response objectives of the NCP, as adopted by CERCLA, will be achieved by this alternative. For this site, the primary remedial response objective is to mitigate releases of asbestos to the air. Other objectives are to mitigate releases of TSP, lead, and chromium to the air, direct contact with contaminated soils and surface water, and ground water contamination. Once implemented, the recommended alternative will mitigate releases of asbestos and other contaminants to the air and eliminate direct contact with contaminated soils by providing a physical barrier between the wastes and the atmosphere. Construction activities involved with the recommended alternative will generate dust and airborne contamination which may have an adverse impact on public health and the environment. Although not consistent with the CERCLA remedial response objectives, these short-term potential health impacts will be minimized by utilizing dust suppression techniques, and the duration of potential construction-generated contamination is relatively short in comparison with the other alternatives. The air monitoring program and associated contingency plan will address air emissions during construction activities and will provide appropriate remedial action in the event that applicable asbestos, lead, chrome, or TSP (PM_{10}) air standards are exceeded after the recommended alternative has been implemented. Since site access will be limited and all surface runoff will be collected in peripheral ditches or will drain into the pits or waste water treatment system, the recommended alternative mitigates direct contact with contaminated surface water. The detection monitoring system will fill existing ground water and surface water data gaps and detect any significant contaminant con-

centrations in the ground water, and the contingency plan will provide for remediation of any such contamination. It should be noted that the recommended alternative is expected to effectively minimize asbestos deposition in Lake Michigan. Based on data concerning waste disposal activities at the site, arsenic does not appear to be attributable to the site. A thorough understanding of the source of the elevated levels of arsenic will be obtained. Active waste disposal areas will be tested to ensure that there is no continued loading of contaminants into the wastewater treatment system.

CERCLA and the NCP require long-term remedies, and the provisions of SARA clearly state a preference for permanent remedies. A brief explanation of freeze/thaw effects will aid in the understanding of the following discussion. In frost-susceptible areas, such as Waukegan, stones and other large particles, such as broken asbestos scraps, tend to move differentially upward through the soil with each freeze/thaw cycle. Thus, asbestos-containing wastes that are covered with soil can, over time, reach the soil surface and become readily releasable to the air. It is for this reason that a cover thickness that exceeds NESHAP requirements was chosen for this site. The six-inch cover with vegetation required by NESHAP does not provide an adequate level of long-term protection to public health and the environment. The cover thickness was designed to ensure that, on the average, the frost layer does not enter the waste materials more than 10 times per century. This would effectively minimize the freeze/thaw effects because no particle movement occurs when the frost layer does not enter the waste materials. In addition, calculations made by Manville's consultant indicate that the recommended 24 inch, two layer cover would prevent asbestos from reaching the surface and becoming releasable to the air for well in excess of 100 years, providing further support for the chosen cover thickness with two layer design. The criteria for selection of the particular cover thickness and profile (soil layering scheme) are further outlined in the paragraphs below describing cost effectiveness. The level of protection offered by the recommended alternative, which is further supplemented by air monitoring and a cover monitoring program that is designed to provide corrective action in the event that asbestos-containing wastes are detected near the cover surface, achieves the objectives of SARA. This statement is made in light of the fact that asbestos is non-combustible and essentially chemically inert, and a true permanent remedy, such as on-site treatment/stabilization, cannot be effected at this site. The detection monitoring system and associated contingency plan included in the recommended alternative will provide appropriate long-term protection to the groundwater at the site, as required by SARA. It should again be noted that, since asbestos is essentially immobile in ground water, the other primary contaminants of concern at the site tend to be immobile in the ground water due to the alkaline environment present at the site, and no residential wells are located downgradient from the site, ground water contamination is not of primary concern at the site. It is expected that the recommended alternative will effectively minimize asbestos levels in Lake Michigan by essentially eliminating airborne deposition of asbestos into Lake Michigan. Finally, in accordance with Section 121(c) of CERCLA, as amended by SARA, this remedial action will be reviewed no less than once each five years after implementation. This review will ensure that human health and the environment are being protected.

Further ground water and surface water data is needed to supplement the limited data collected during the RI. It cannot presently be determined whether the site is in compliance with the terms of the Great Lakes Water Quality Agreement of 1978 (GLWQA) and U.S. EPA Ground Water Protection Strategy (GWPS). Based on the single round of RI sampling, asbestos and arsenic levels in Lake Michigan are currently exceeding U.S. EPA ambient water quality criteria, and asbestos levels are also exceeding Illinois water quality standards for general use and public water supply. In this respect, the site is not currently meeting the requirements of the Clean Water Act, as amended by the WQA of 1987 (as mentioned previously, arsenic may not be attributal to the site). The soil covering (with vegetation) portion of the recommended alternative is expected to effectively minimize asbestos levels in Lake Michigan by essentially eliminating airborne asbestos deposition into the Lake. The ground water and surface water detection monitoring system included in the recommended alternative will generate the additional data needed to determine the compliance status of the site with respect to the above acts, agreements, and strategies, and the ground water/ surface water contingency plan to be developed will ensure that appropriate remedial action will be taken if the source control measures in the recommended alternative are not effective in reducing contaminant concentrations to levels that comply with all applicable water quality standards and criteria.

The provisions of RCRA are presently being met at the site, and none of the activities undertaken as part of the recommended alternative will result in noncompliance with RCRA.

The recommended alternative considers worker exposure to contaminants, and the work practices and personal protective equipment to be utilized during the implementation of the recommended alternative will comply with the applicable requirements of OSHA.

Since the recommended alternative complies with federal NESHAP requirements, it also complies with the State NESHAP regulations for asbestos. The recommended alternative also meets State of Illinois Environmental Protection Rules and Regulations, Part 807, Subpart C, Section 807.305, which requires that not less than two feet of suitable material be placed over the over the inactive areas of the waste disposal area. This is stated in a letter from the State of Illinois which listed the State Applicable, Relevant, and Appropriate Requirements (ARARs) for the site. The State letter is included as Appendix III to this summary. The recommended alternative will not achieve the soil composition requirements in the State of Illinois draft Waste Management Facilities Design Criteria; however, these requirements are not ARARs for this site (refer to Appendix III).

The discussion of cost-effectiveness for the remedial alternatives for the site must be broken down into two parts: 1) cost-effectiveness comparison of recommended alternative to other alternatives and 2) cost-effectiveness comparison of different cover thickness and soil profile scenarios.

The recommended alternative is the most cost-effective alternative because, with the possible exception of construction-generated dust and airborne contamination, it either meets or exceeds all federal and State ARARs or provides contingency plans to meet all federal and State ARARs at a more reason-

able cost than the other alternatives that provide a roughly equivalent level of protection to public health and the environment. The no action alternative and grading and seeding alternative do not meet all applicable regulations and allow asbestos and other contaminants to be released to the environment immediately, in the case of the no action alternative, and in the long-term, in the case of the grading and seeding alternative. Considering the hazardous nature of asbestos in air and the hazardous nature of the other contaminants present at the site in the air, ground water, and surface water, these alternatives neither meet the goals of CERCLA and SARA nor represent an acceptable situation from an environmental standpoint. When comparing the recommended soil covering alternative to the two landfilling alternatives, the primary goal of cleanup at the site and cost must be considered. Considering the nature and extent of contamination at the site, the primary goal is to prevent releases of asbestos to the air. All three alternatives achieve this goal in the long term; however, the landfilling alternatives involve a significantly greater amount of potential construction-generated contamination than the recommended alternative. In addition, the duration of construction activities is much longer for the landfilling alternatives, thus presenting an increased period of potential public health hazards compared to the recommended alternative. In summary, when remediating asbestos contamination as is present at the site, it is desirable to remediate the contamination in place, with as little disturbance of asbestos-containing wastes as possible. The recommended alternative provides a clear advantage over the landfilling alternatives in meeting these goals. Other concerns at the site include mitigating releases of lead, TSP, and chromium to the air, mitigating direct contact with waste materials and soils, and detecting and mitigating ground water contamination at the site. All three alternative provide an essentially equivalent level of protection from direct contact with waste materials and soil, and the landfilling alternatives provide a slightly greater degree of ground water and surface water protection than the recommended alternative; however, ground water contamination is not of primary concern at the site. Both landfilling alternatives involve an order of magnitude greater capital cost and greater annual O&M costs than the recommended alternative.

In summary, the recommended alternative is the most cost-effective remedy because it meets or exceeds all federal and State ARARs or provides contingency plans to meet all federal and State ARARs, provides the greatest degree of protection toward meeting the primary cleanup goal at the site, and costs an order of magnitude less than other alternatives which provide a similar degree of protection to public health and the environment.

Capital and O&M costs for the recommended alternative are summarized in Table VIII.

Regarding the cover thickness to be applied at the site, several factors must be taken into consideration. The rate at which the waste particles move upward through the covering layer and the depth of penetration of the frost layer are dependent upon the type of soil used for cover, and whether the wastes reach the surface of the covering layer is dependent on the thickness of the cover. The soils proposed for use at the Manville site are the sandy soil available in the borrow pit at the northern portion of the Manville property and a clayey silt available in a pit near the site. In all further discussions, the terms "sand" and "clay" will be used to represent the above-mentioned soils. If the frost layer does not enter

the waste materials, then no upward movement of waste materials will occur, and no risk of asbestos particles reaching the surface through freeze/thaw effects will exist. A minimum of 34 1/2 inches of sand or 33 inches of clay would be required to prevent the frost layer from entering the waste materials, assuming that vegetation is grown on the surface and accounting for the insulating properties of snow. Such thickness of soil cover would cost a minimum of $5.1 million (present worth) which is $600,000 greater than the cost of the recommended alternative.

Another consideration is the rate at which particles move upward through the soil cover. Although actual rates of movement are not known and cannot be predicted with accuracy, some definite trends are known. Particles move more slowly upward through non-frost-susceptible (NFS) soils, such as sand, which do not form ice lenses and thus do not allow as great a degree of frost heave as frost-susceptible soils, such as clay. Unfortunately, the frost layer penetrates further in sandy soils than clayey soils. The result is that sand allows the frost layer to reach the waste materials more often than clay but retards the movement of particles when the frost reaches them.

Two concepts have been discussed relative to freeze/thaw effects. The first is penetration, whether the frost layer reaches contaminated particles. If the frost layer does not reach the particles, the particles will not be effected by the freeze/thaw cycle and will not move upward through the covering layer. This is the most important consideration in cover design; the entire process of upward movement of particles begins when and if the frost layer penetrates to the waste materials, and, thus, particle movement can be most effectively controlled by minimizing the frequency with which the frost layer penetrates to the waste materials. In addition, the depth of frost penetration can be predicted with considerable accuracy for a given soil and given climatological conditions. This allows a high level of confidence in the calculations of frequency of penetration. Although, due to a lack of empirical data, rates of movement are not known accurately, it can be stated that once the frost layer penetrates to contaminated particles, the particles will begin to enter the covering layer and eventually reach the surface. This condition is the second concept, failure, which literally means that the cover fails by allowing contaminants to reach the surface and become releasable to the air. Failure is dependent upon the rate of movement of particles, which is in turn dependent on soil types and cover thickness. Since the rate of movement of particles cannot be predicted with accuracy, failure cannot be predicted with accuracy. Rate of movement of particles is thus a secondary consideration in cover design, and data regarding rates of particle movement were used only as an additional measure of support for the recommended cover thickness once the penetration criterion was met. Regarding the calculation of particle rates of movement, sand is more desirable since it retards particle movement to a greater degree than clay, and its properties are more well known than that of the clay to be used. This results in a greater confidence in the calculated values for the sand. A third factor which must be considered in cover design is cost, and the other relevant consideration in determining the most cost-effective cover thickness is availability of materials (soils).

The most cost-effective remedy would provide the greatest degree of protection to public health and the environment at the most reasonable cost,

while using available materials. Clearly, these factors are interrelated. The criteria used for selection of the recommended cover thickness were: 1) to minimize the number of times the frost layer enters the waste materials (thus minimizing the potential for waste particles to enter the covering layer), 2) to ensure, as additional support, that an essentially 100 percent probability that asbestos-containing wastes do not reach the surface in 100 years is attained, 3) to provide a measure or measures for detecting whether asbestos-containing wastes are near the surface and ensuring that proper action is taken to prevent the waste particles from reaching the surface and becoming releasable to the air, and 4) to achieve criteria 1) through 3) at a reasonable cost, using available materials. The U.S. EPA recommended cover thickness is designed to ensure that the frost layer does not enter the waste materials more than 10 times per century (thus retarding cover failure) and, as an additional assurance of protection of public health, provides an essentially 100 percent probability that asbestos-containing wastes will not reach the cover surface and become releasable to the air in 100 years. From a health standpoint, the most important criterion is criterion #1, for the reasons listed above. The design parameter of penetration 10 times per century is considered to be the maximum allowable frequency of penetration for the site for protection of public health and the environment. For the reasons stated above, it is desirable to further minimize the frequency of penetration; however, the criterion of penetration 10 times per century was chosen for this site since: 1) this frequency of penetration is expected to prevent asbestos and other waste materials from becoming releasable to the air for a minimum of 100 years, which is an appropriate period for cover design, 2) the non-frost-susceptible nature of the bottom six inches of the cover provides a degree of justification for the higher frequency of penetration, 3) choosing this frequency of penetration is consistent with a court precedent set in U.S. EPA-Region I involving asbestos waste disposal sites, and 4) additional protection against penetration (i.e., thicker cover) involves higher cost and increased use of less available materials. The soil to be used in the cover is available; the six inches of sand to be used is available in Manville's borrow pit, and the clay is available from a nearby offsite pit. The cover monitoring program that will be developed will provide measures for detecting whether asbestos-containing wastes are near the cover surface and will ensure that proper remedial action will be taken to ensure that waste particles containing asbestos do not become releasable to the air. The cost of the recommended alternative with the 24 inch cover is $4,488, 000 (present worth), with an estimated capital cost of $4,026,000 and annual O & M costs of $49,000. U.S. EPA believes that, considering all relevant criteria, the 24 inch cover thickness with two layer design is the most cost-effective cover thickness for the site. It is conceivable that a different profile (soil layer composition) and cover thickness that might achieve the same degree of protection to public health and the environment could be implemented at a lesser cost; however, the State of Illinois ARAR must be met, and the health-based criteria used to develop the recommended cover thickness (i.e., minimization of the frequency of frost penetration into the waste materials, with 10 times per century as the maximum allowable frequency for the two cover system being used, and, as an additional measure of support, an essentially 100 percent probability that the cover will not fail in 100 years) should not be compromised, considering the hazardous nature of asbestos in air. The Manville recommended cover thickness of 18 inches, composed of 15 inches

of clay and three inches of top soil, is not acceptable since, based on climatological data, it would allow the frost layer to penetrate to the waste materials approximately 50 times per century and, based on Manville's consultant's calculations, may allow the cover to fail in less than 100 years. The cost reduction of Manville's 18 inch cover when compared with U.S. EPA's recommended cover thickness is 10 percent.

OPERATION AND MAINTENANCE (O & M)

The projected O & M activities required to ensure the effectiveness of the remedy are the cover monitoring program and associated contingency plan, the air monitoring program and associated contingency plan, the ground water detection monitoring system and associated contingency plan, and the plan for sludge disposal. The ground water detection monitoring system has been described previously, and the details of the remaining O & M activities will be developed as part of the RD/RA implementation process. The purposes of these remaining O & M activities are described in the FS Report and are tabularized and presented in Table IX. The estimated annual O & M costs and durations for the recommended alternative are presented in Table VIII.

SCHEDULE

Complete Enforcement Negotiations	May 26, 1987
Approve Remedial Action (Sign ROD)	June, 1987
Start Design	September, 1987
Complete Design	March, 1988
Start Construction	April, 1988
Complete Construction	December, 1989

FUTURE ACTIONS

Long-term O & M required to maintain the effectiveness of the remedy include the cover monitoring program and associated contingency plan, the air monitoring program and associated contingency plan, the ground water detection monitoring system and associated contingency plan, and the plan for sludge disposal. The ground water detection monitoring system was described in the Recommended Alternative section, and the details of the remaining O&M activities will be developed as part of the RD/RA implementation process. Refer to Table IX for a list of the purposes of the O & M activities included in the recommended alternative.

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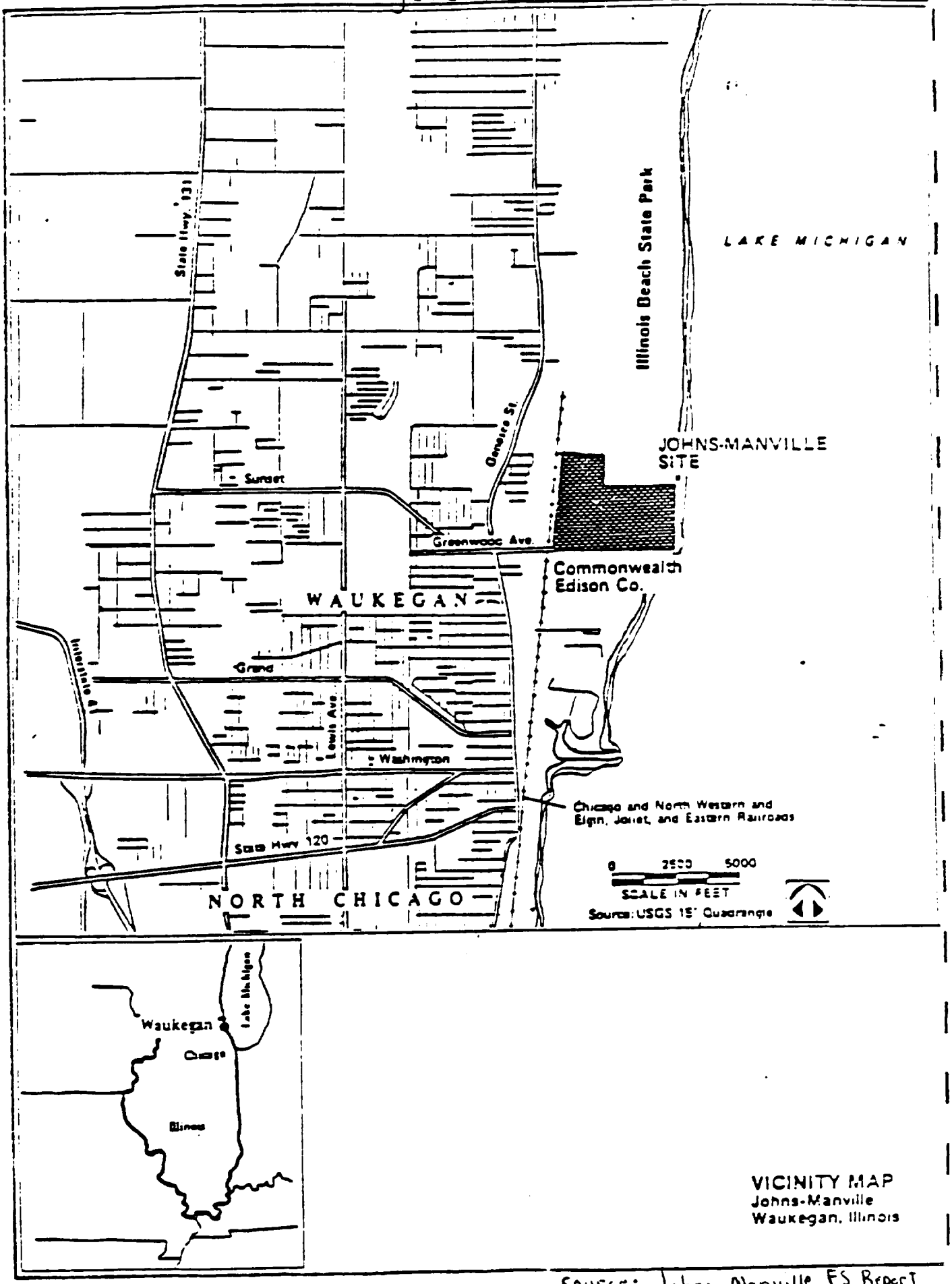
revised 6/8/87:mt: rev. 6/24/87:adr

Figures

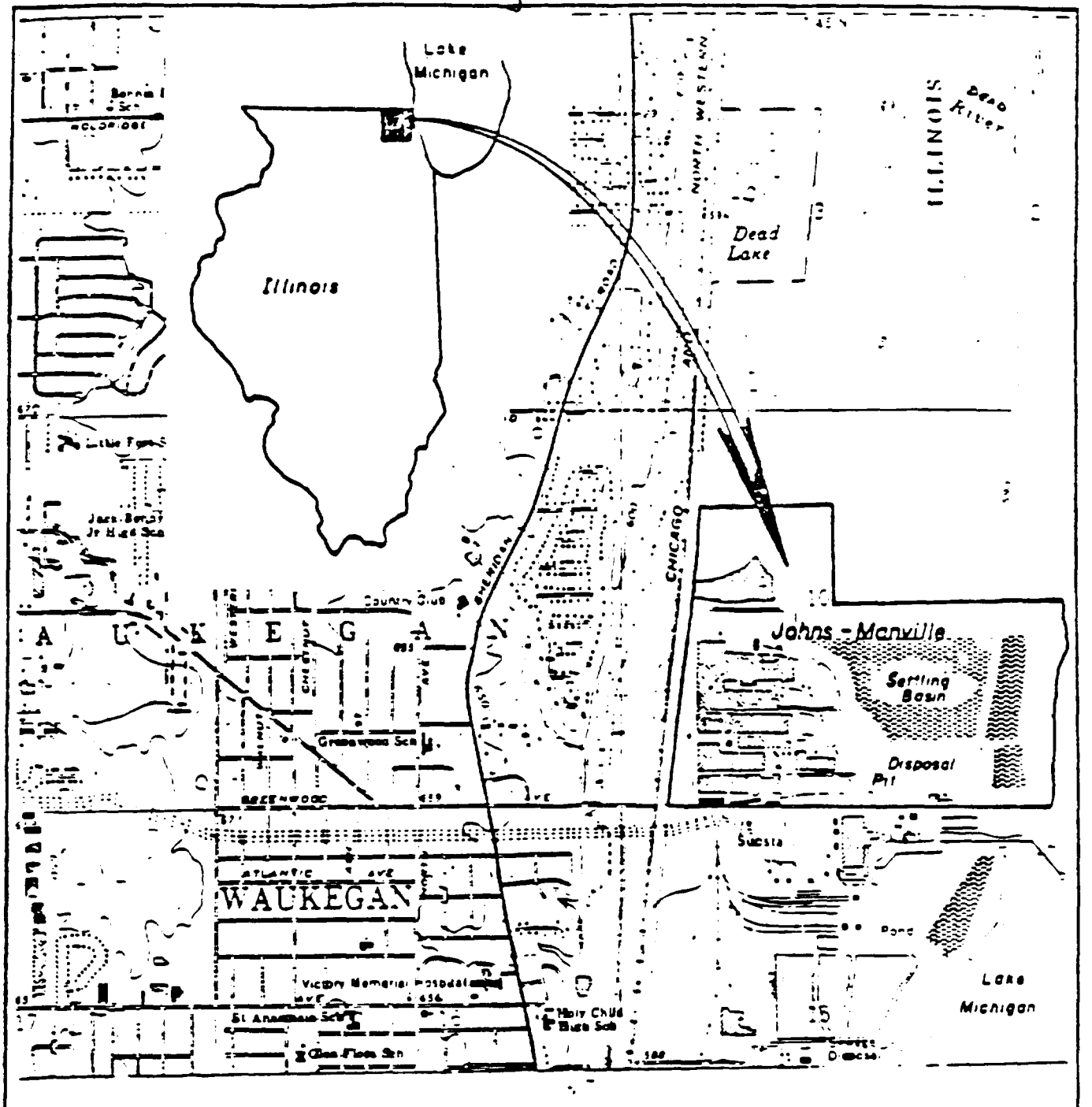
Figure I



VICINITY MAP
Johns-Manville
Waukegan, Illinois

Source: Johns-Manville FS Report
KMA - December 1986

Figure II



N

1"=2000'

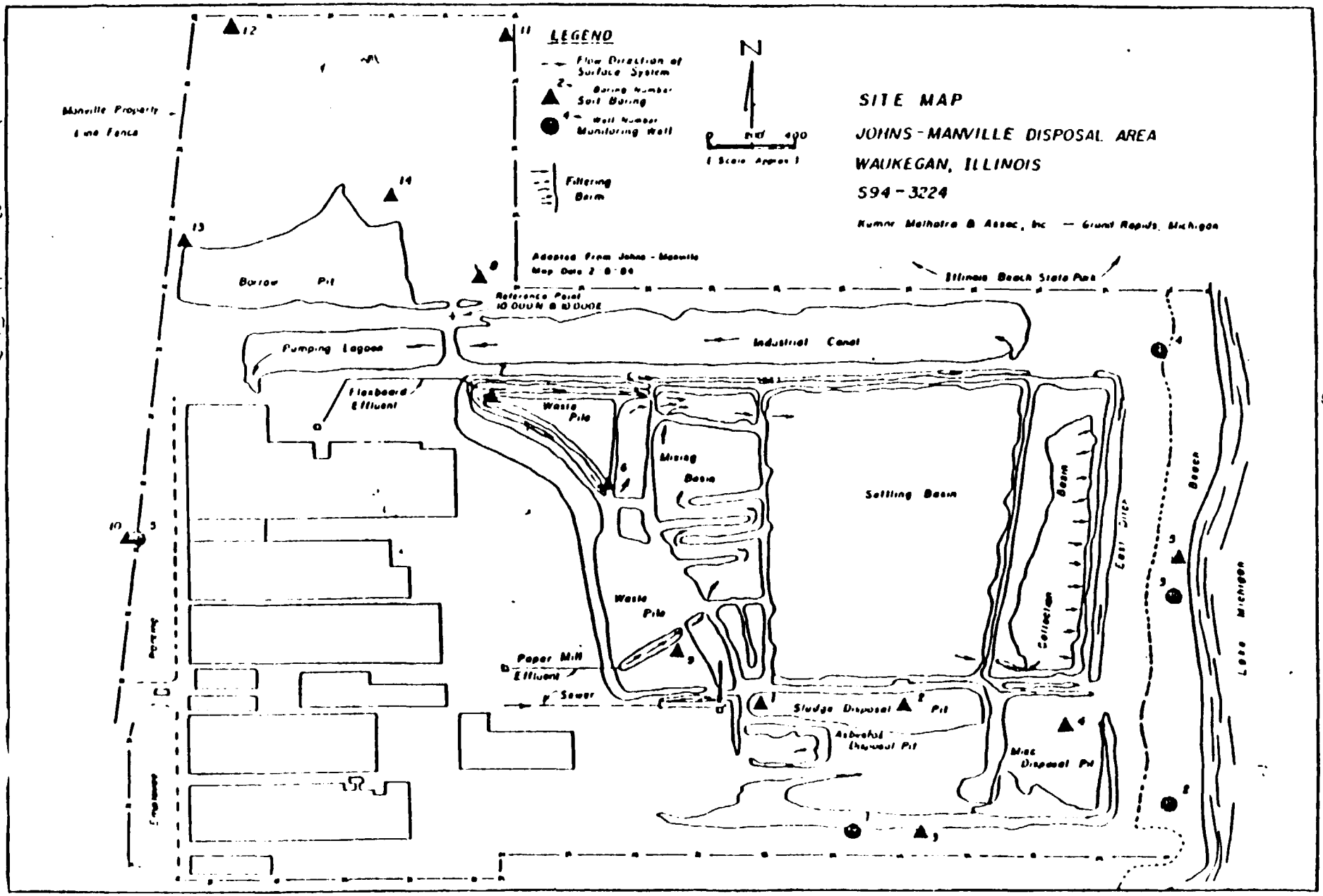
Map adapted from USGS Zion Quad. Map

1/85

REGIONAL LOCATION MAP
JOHNS-MANVILLE DISPOSAL AREA
WAUKEGAN, ILLINOIS

S94-3224

Source: Johns-Manville FS Report - December 1986
Kumar Mainotra & Assoc, Inc - Grand Rapids, Michigan

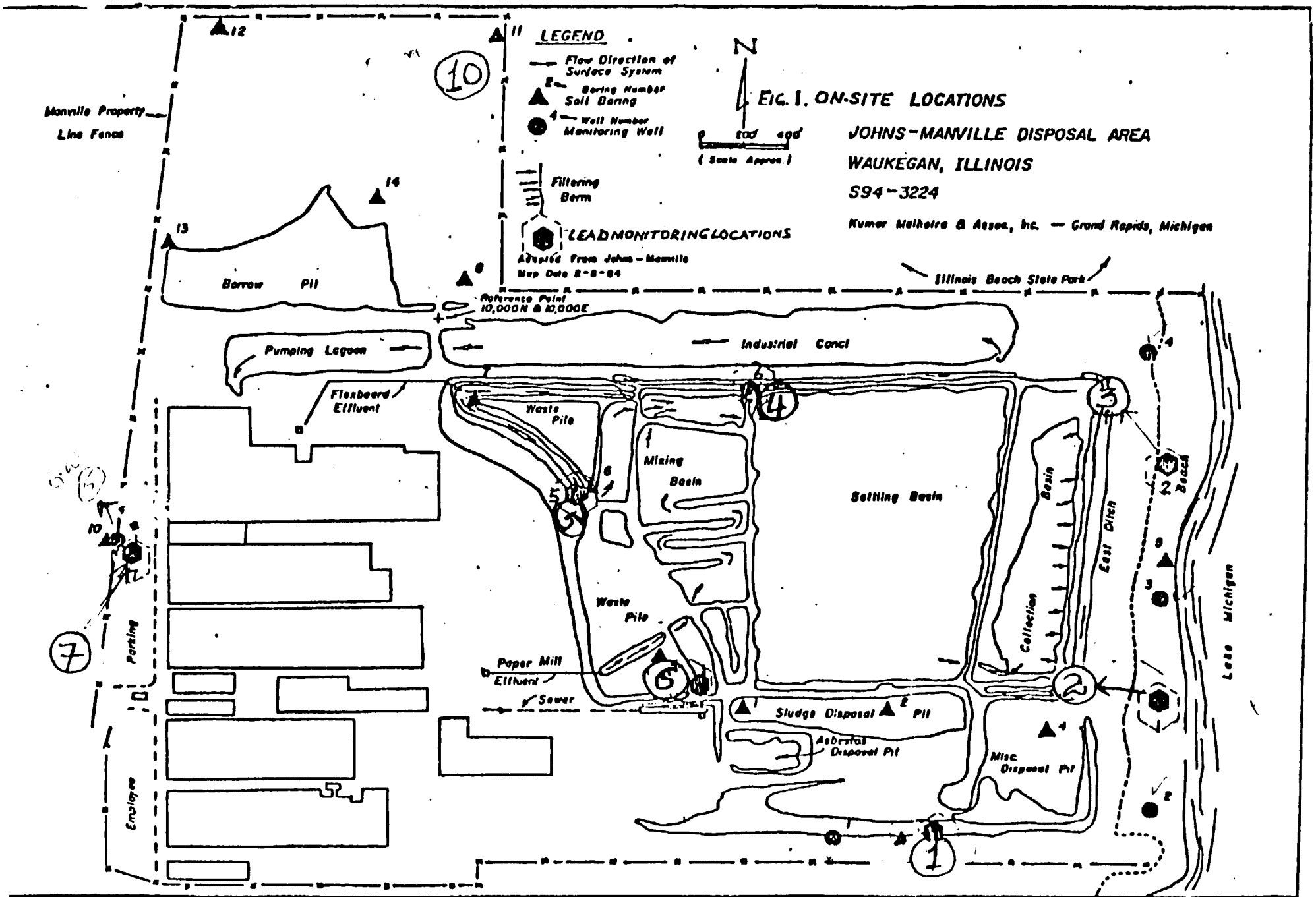


Source: Johns-Manville FS Report
KMA - December 1986

Figure 11

Figure IV

On-Site TSP, Lead Air Sampling Locations



Source: "Ambient Air Quality Survey for Johns-Manville – Waukegan, Illinois"

Figure V

Off-Site TSP/Lead Air Sampling Locations

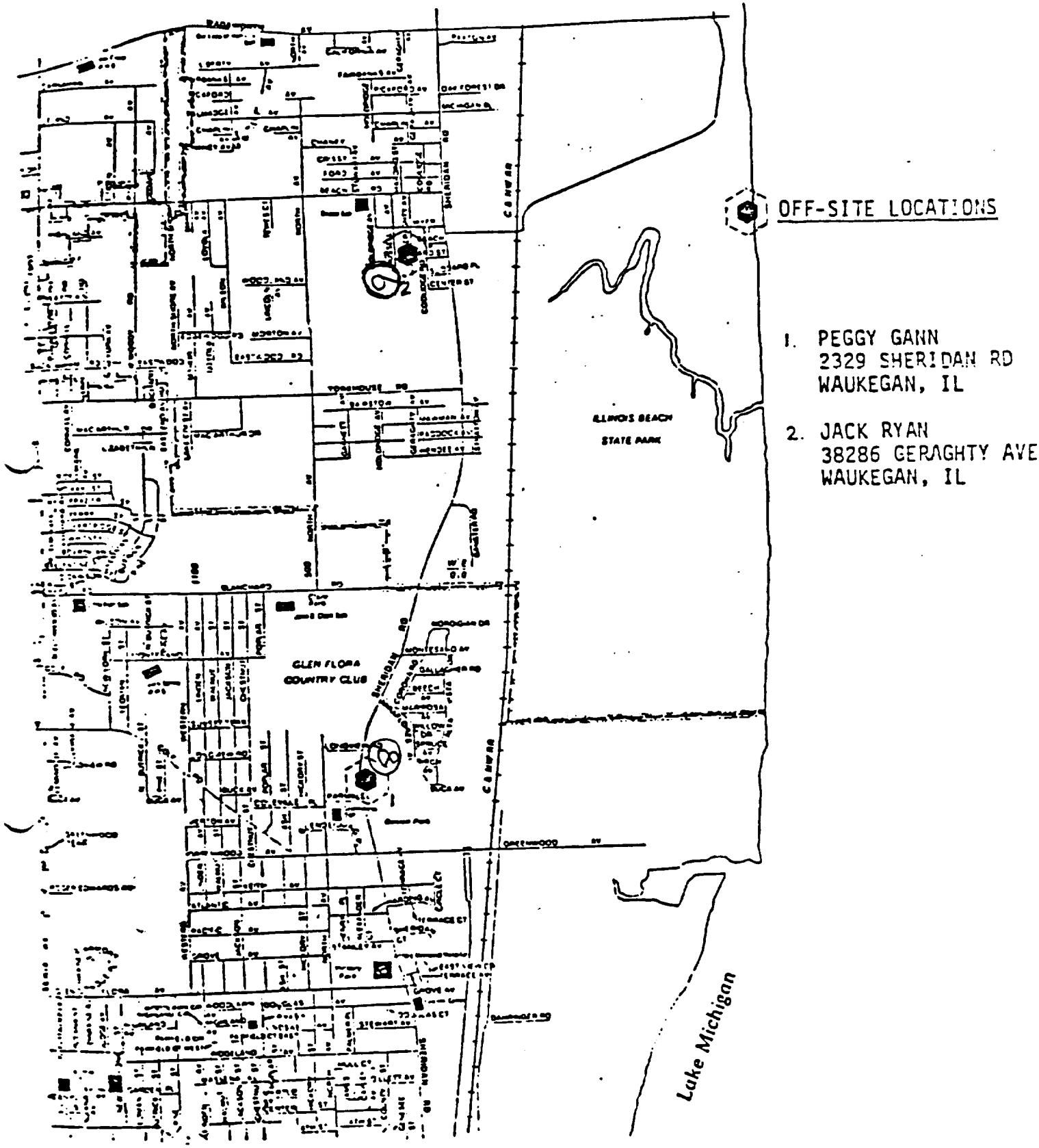


Figure 2 Locations of Off-Site Samplers.

Source: "Ambient Air Quality Survey for Johns-Manville Company Waukegan, Illinois" Clayton Environmental Consultants August 26, 1985

Figure VI
Sampling Locations

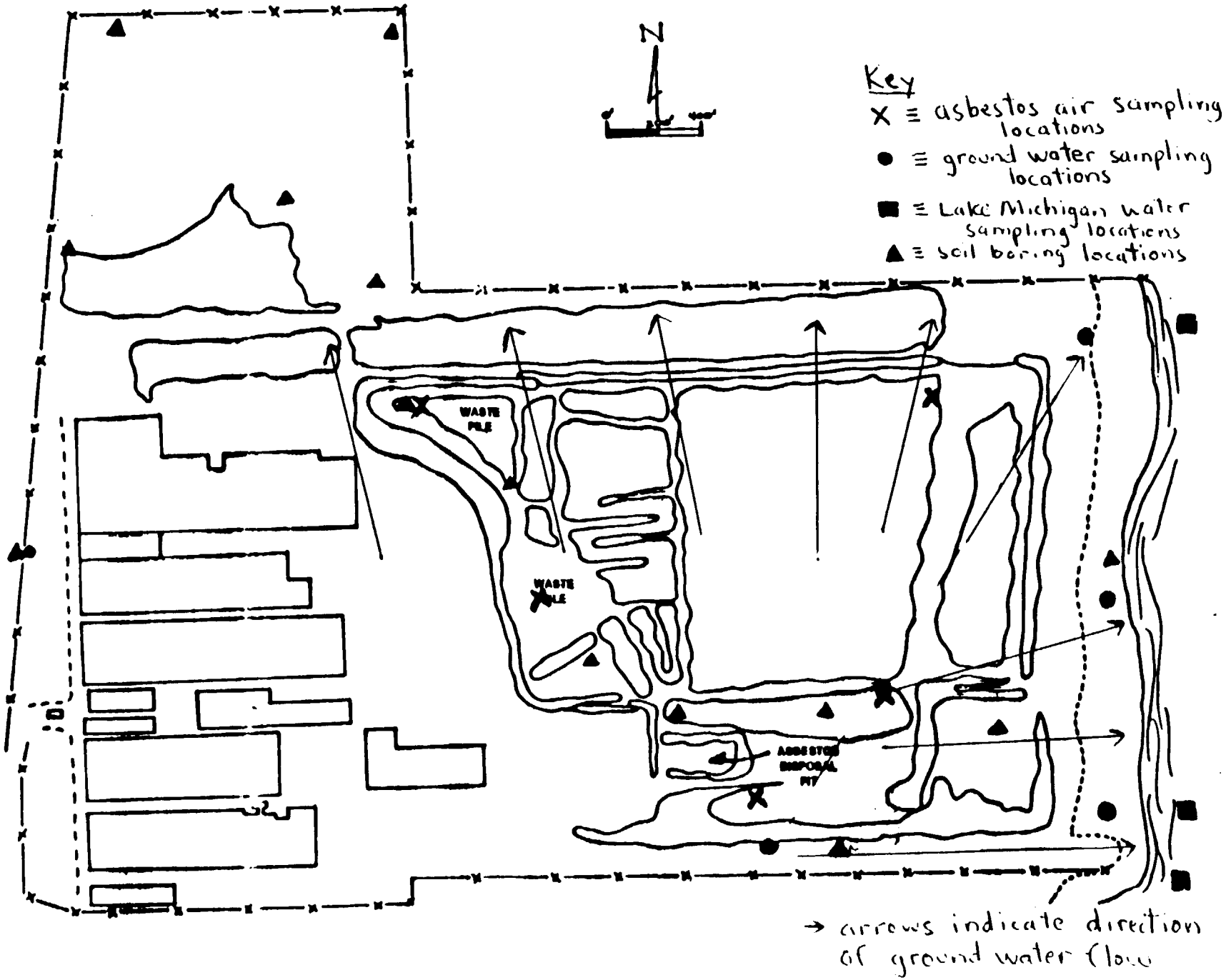
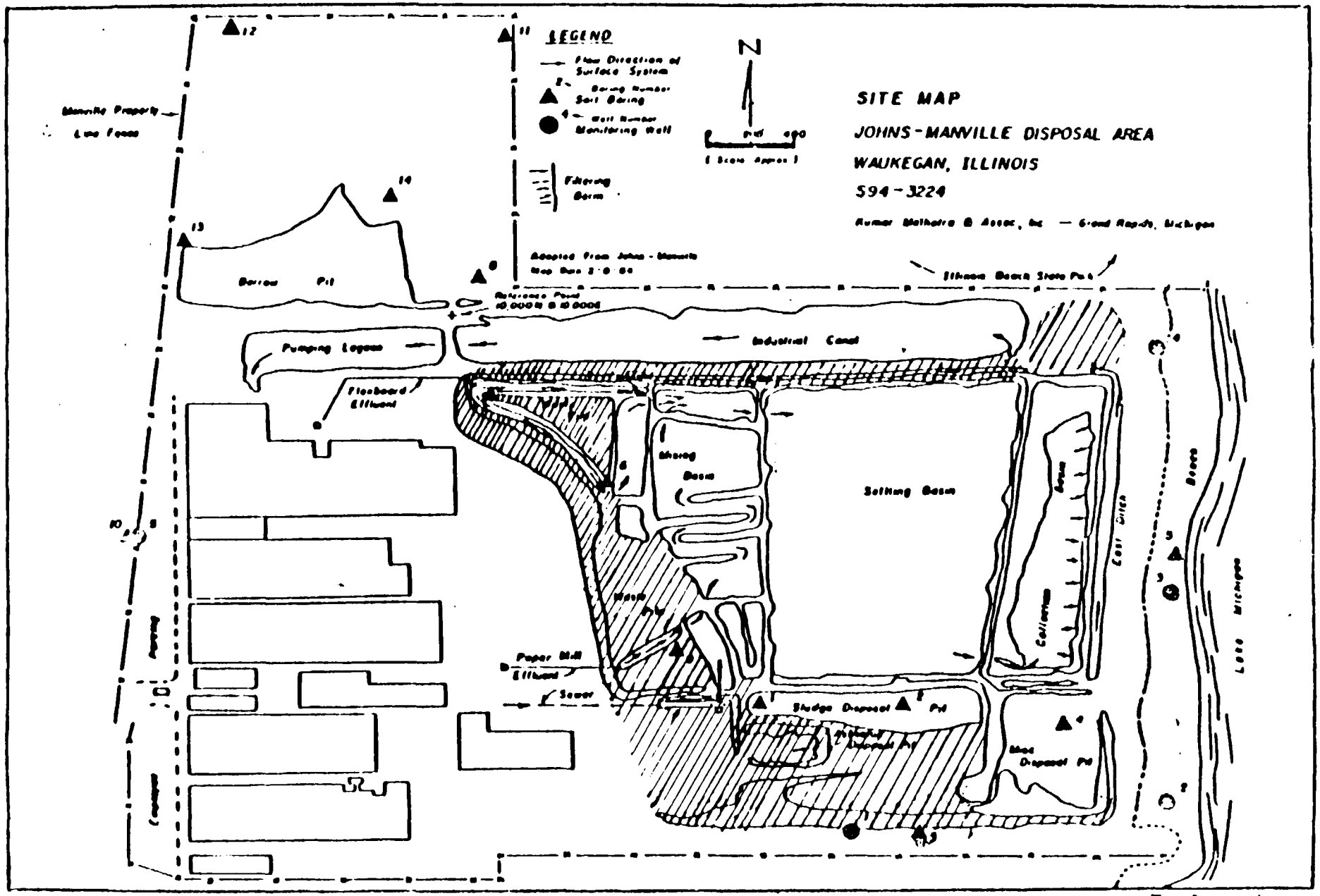


FIGURE VII

Site Areas to Which Soil Cover With Vegetation Will be Applied (Shaded)



Source: Johns-Manville FS Report
KMA December 1986

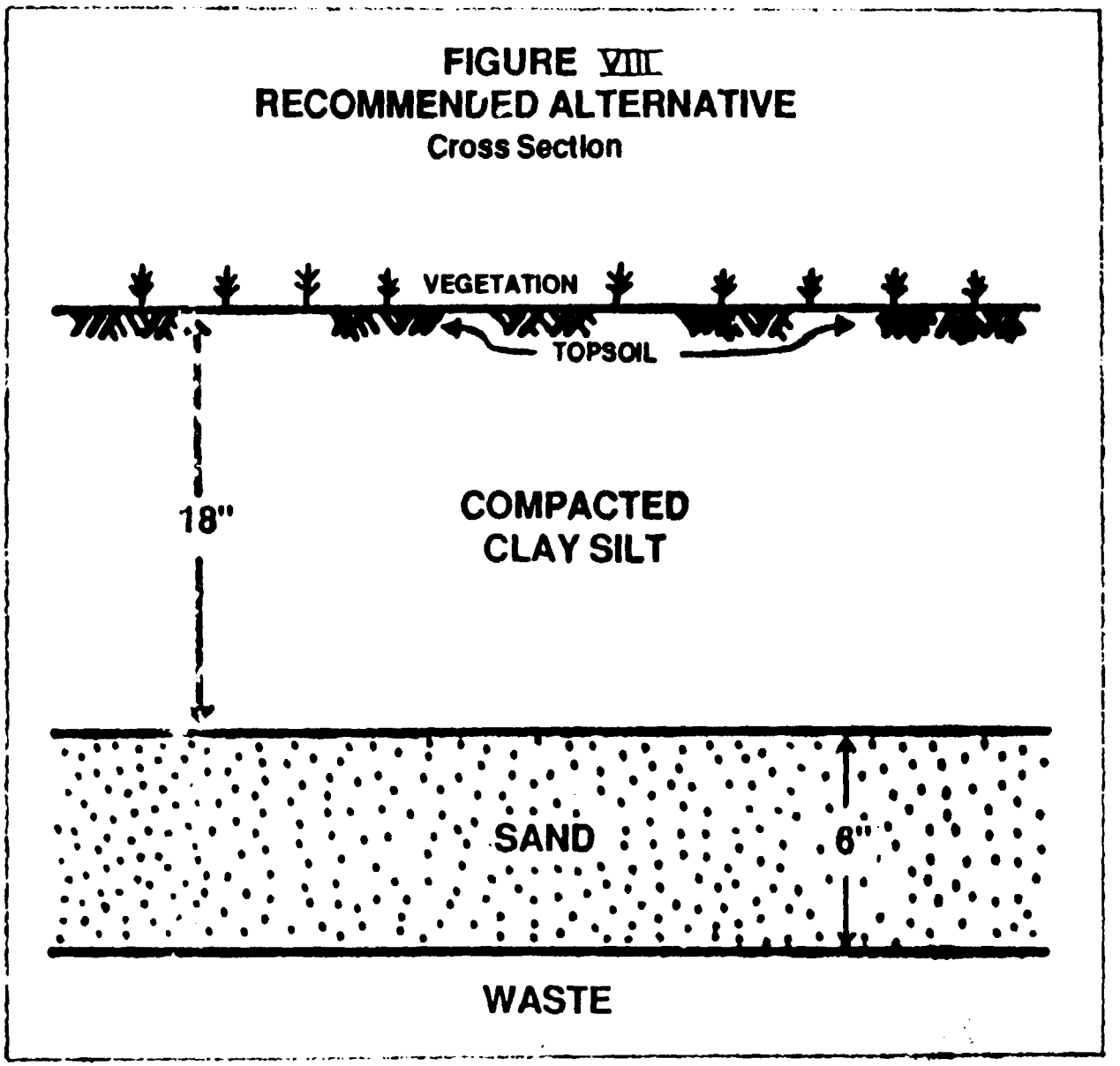
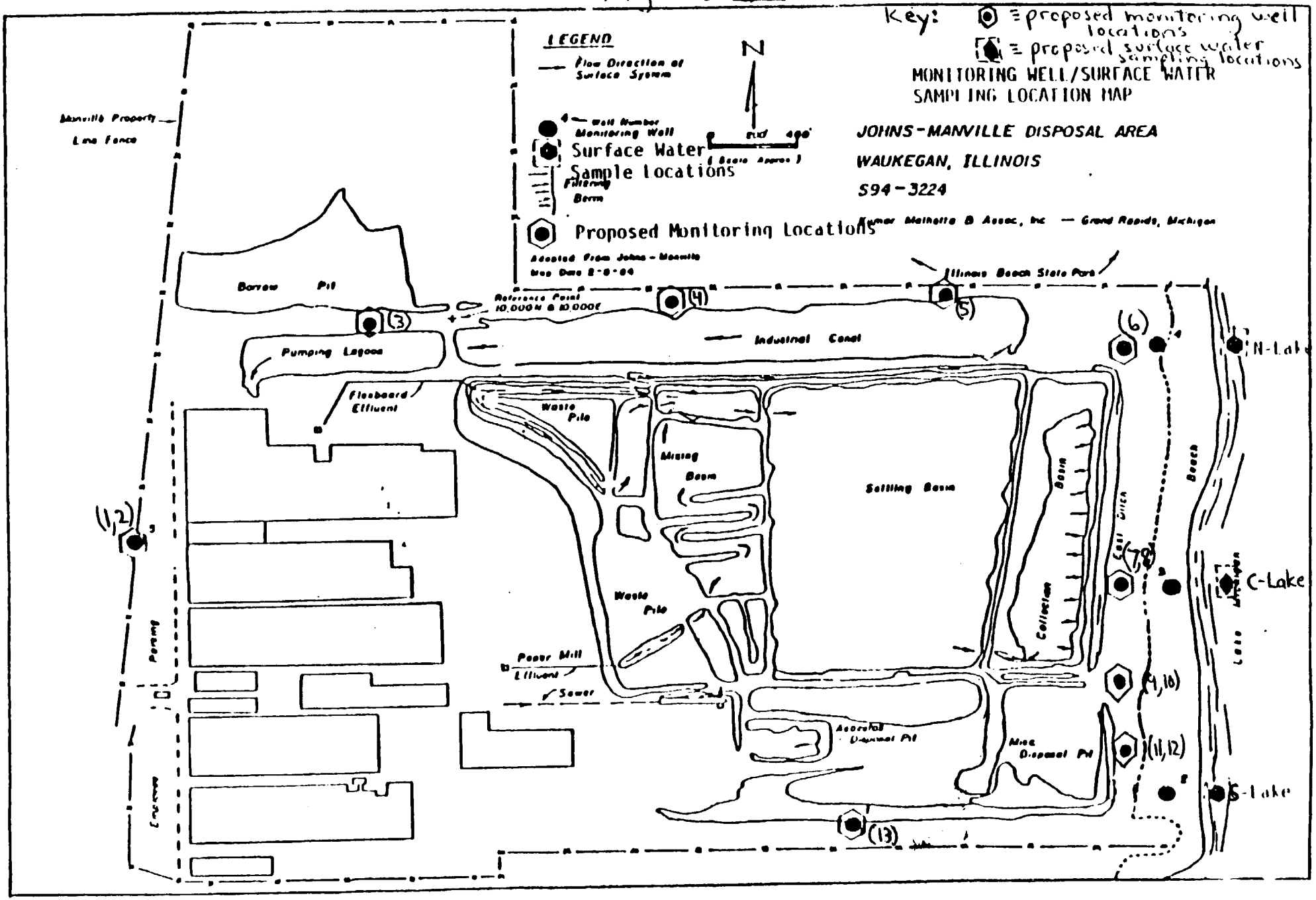


FIGURE VIII
RECOMMENDED ALTERNATIVE
Cross Section
VEGETATION
TOPSOIL
18"
COMPACTED
CLAY SILT
SAND
6"
WASTE

Figure IX


Key: ⬡ = proposed monitoring well locations
⬡ = proposed surface water sampling locations
MONITORING WELL/SURFACE WATER SAMPLING LOCATION MAP
JOHNS-MANVILLE DISPOSAL AREA
WAUKEGAN, ILLINOIS
594-3224
LEGEND
Flow Direction of Surface System
Well Number Monitoring Well
Surface Water Sample Locations
Filtering Berm
Proposed Monitoring Locations
Adapted From Johns-Manville Map Date 8-8-84
N
Manville Property Line Fence
Borrow Pit
Reference Point 10,000N & 10,000E
Illinois Beach State Park
Industrial Canal
Pumping Lagoon
Flasboard Effluent
Waste Pile
Mixing Basin
Settling Basin
Basin
Coal Slag
Beach
N-Lake
C-Lake
S-Lake
Lake
Collection
Power Mill Effluent Sewer
Asbestos Disposal Pit
Misc. Disposal Pit
Power Line
Canal
(1,2)
(3)
(4)
(5)
(6)
(7,8)
(9,10)
(11,12)
(13)

Tables

Table I
Asbestos Air Sampling Results

Source: Johns-Manville RI Report - Volume I
KMA - July 1985

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS
WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING
RUN 1 - 23 OCTOBER 1984

Job Number 84487

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type *
	Fiber Concentration (Fibers/ml)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/ml)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
ON-SITE SAMPLES											
Location 1	0.021	0.005 - 0.036	0.000589	14	35	0.003	0.0009 - 0.007	0.000589	13	5	CT
	NSS	0 - 0.005	0.000589	29	2	NSS	0 - 0.004	0.000589	29	1	AT
Location 2	NSS	0 - 0.006	0.000652	0.01	3	ND	0 - 0.003	0.000652	-	0	CT
	ND	0 - 0.003	0.000652	-	0	ND	0 - 0.003	0.000652	-	0	AT
Location 3	NSS	0 - 0.006	0.000634	0.01	3	ND	0 - 0.003	0.000634	-	0	CT
	NSS	0 - 0.005	0.000634	0.06	2	ND	0 - 0.003	0.000634	-	0	AT
Location 4	0.020	0.011 - 0.029	0.000673	0.7	11	NSS	0 - 0.006	0.000673	0.3	1	CT
	NSS	0 - 0.005	0.000673	36	2	NSS	0 - 0.004	0.000673	33	1	AT
Location 5	0.001	0.001 - 0.008	0.000660	0.02	5	ND	0 - 0.003	0.000660	-	0	CT
	NSS	0 - 0.005	0.000660	0.2	2	ND	0 - 0.003	0.000660	-	0	AT

** No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.
ND = No fibers detected
NSS = Not Statistically Significant (1 to 4 fibers detected)

*CT = Total Chrysotile Fibers plus Bundles
*AT = Total Amphibole Fibers plus Bundle

* NAM = Non Asbestos Mineral Fibers plus Bundles
* MM = Man Made Mineral Fibers plus Bundles

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS

WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING

RUN 1 - 23 OCTOBER 1984

Job Number B4487

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type*
	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
OFF-SITE SAMPLES											
Location 1	0.004	0.001 - 0.008	0.000532	0.02	7	ND	0 - 0.002	0.000532	-	0	CI
	NSS	0 - 0.005	0.000532	0.2	3	ND	0 - 0.002	0.000532	-	0	AI
Location 2	NSS	0 - 0.004	0.000603	0.002	1	ND	0 - 0.003	0.000603	-	0	CI
	ND	0 - 0.003	0.000603	-	0	ND	0 - 0.003	0.000603	-	0	AI
Location 3	ND	0 - 0.003	0.000610	-	0	ND	0 - 0.003	0.000610	-	0	CI
	NSS	0 - 0.005	0.000610	0.02	2	ND	0 - 0.003	0.000610	-	0	AI

**No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.
ND = No fibers detected
NSS = Not Statistically Significant (1 to 4 fibers detected)

*CI = Total Chrysotile Fibers plus Bundles
*AI = Total Amphibole Fibers plus Bundles

* NAM = Non Asbestos Mineral Fibers plus Bundles
* MMM = Man Made Mineral Fibers plus Bundles

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS

WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING

RUN 2 - 24 OCTOBER 1984

Job Number 84417

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type *
	Fiber Concentration (Fibers/ml)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/ml)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
ON-SITE SAMPLES											
Location 1	0.065	0 - 0.15	0.000759	88	85	NSS	0 - 0.006	0.000620	66	3	CI
	NSS	0 - 0.006	0.000620	3.3	3	NSS	0 - 0.006	0.000620	3.3	3	AI
Location 2	0.006	0.003 - 0.012	0.000633	5.3	10	NSS	0 - 0.005	0.000633	5.1	2	CI
	NSS	0 - 0.005	0.000633	0.5	2	ND	0 - 0.003	0.000633	-	0	AI
Location 3	0.005	0.002 - 0.010	0.000632	0.7	8	NSS	0 - 0.004	0.000632	0.6	1	CI
	ND	0 - 0.003	0.000632	-	0	ND	0 - 0.003	0.000632	-	0	AI
Location 4	0.009	0.005 - 0.016	0.000625	0.8	15	NSS	0 - 0.007	0.000625	0.2	4	CI
	NSS	0 - 0.005	0.000625	19	2	NSS	0 - 0.004	0.000625	19	1	AI
Location 5	0.020	0 - 0.046	0.000652	35	31	0.006	0.002 - 0.012	0.000652	35	5	CI
	NSS	0 - 0.004	0.000652	0.1	1	ND	0 - 0.003	0.000652	-	0	AI

**No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined
ND = No fibers detected
NSS = Not Statistically Significant (1 to 4 fibers detected)

*CI = Total Chrysotile Fibers plus Bundles
*AI = Total Amphibole Fibers plus Bundles

§ NAM = Non-Asbestos Mineral Fibers plus Bundles
§ MMM = Man Made Mineral Fibers plus Bundles

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS

WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING

RUN 2 - 24 OCTOBER 1984

Job Number 84487

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type *
	Fiber Concentration (Fibers/ml)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/ml)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
OFF-SITE SAMPLES											
Location 1	SAMPLE NOT AVAILABLE										CT
											AT
Location 2	NSS	0 - 0.004	0.000540	0.009	2	ND	0 - 0.002	0.000540	-	0	CT
	NSS	0 - 0.004	0.000540	4.7	2	ND	0 - 0.002	0.000540	-	0	AT
Location 3	ND	0 - 0.003	0.000723	-	0	ND	0 - 0.003	0.000723	-	0	CT
	NSS	0 - 0.004	0.000723	0.05	1	ND	0 - 0.003	0.000723	-	0	AT

** No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.
ND = No fibers detected
NSS = Not Statistically Significant (1 to 4 fibers detected)

*CT = Total Chrysotile Fibers plus Bundles
*AT = Total Amphibole Fibers plus Bundles

* NAM = Non Asbestos Mineral Fibers plus Bundles
* MMM = Man Made Mineral Fibers plus Bundles

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS

WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING

RUN 3 - 29 OCTOBER 1984

Job Number 84487

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type *
	Fiber Concentration (Fibers/ml)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/ml)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
ON SITE-SAMPLES											
Location 1	0.006	0.003 - 0.011	0.000552	0.09	11	NSS	0 - 0.004	0.000552	0.02	1	CI
	NSS	0 - 0.004	0.000552	0.3	1	ND	0 - 0.003	0.000552	-	0	AI
Location 2	0.003	0.001 - 0.008	0.000571	0.07	6	ND	0 - 0.003	0.000571	-	0	CI
	NSS	0 - 0.005	0.000571	0.01	2	ND	0 - 0.003	0.000571	-	0	AI
Location 3	0.003	0.0008- 0.007	0.000547	0.02	5	ND	0 - 0.003	0.000547	-	0	CI
	NSS	0- 0.006	0.000547	0.07	4	ND	0 - 0.003	0.000547	-	0	AI
Location 4	0.004	0.001 - 0.009	0.000566	0.3	7	ND	0 - 0.003	0.000566	-	0	CI
	NSS	0 - 0.005	0.000566	0.1	3	ND	0 - 0.003	0.000566	-	0	AI
Location 5	0.006	0.002 - 0.012	0.000608	0.04	10	ND	0 - 0.003	0.000608	-	0	CI
	NSS	0 - 0.006	0.000608	0.4	3	ND	0 - 0.003	0.000608	-	0	AI

** No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.
ND = No Fibers Detected
NSS = Not Statistically Significant (1 to 4 fibers detected)

*CI = Total Chrysotile Fibers plus Bundles
*AI = Total Amphibole Fibers plus Bundles

* NAM = Non Asbestos Mineral Fibers plus Bundles
* MMM = Man Made Mineral Fibers plus Bundles

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SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS

WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING

RUN 3 - 29 OCTOBER 1984

Job Number 84487

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type *
	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
OFF-SITE SAMPLES											
Location 1	NSS	0 - 0.005	0.000606	0.06	2	ND	0 - 0.003	0.000606	-	0	CI
	NSS	0 - 0.007	0.000606	0.2	4	ND	0 - 0.003	0.000606	-	0	AI
Location 2	0.003	0.001 - 0.009	0.000690	0.03	5	ND	0 - 0.003	0.000690	-	0	CI
	NSS	0 - 0.008	0.000690	0.2	4	ND	0 - 0.003	0.000690	-	0	AI
Location 3	NSS	0 - 0.006	0.000596	0.008	3	ND	0 - 0.003	0.000596	-	0	CI
	NSS	0 - 0.007	0.000596	4.9	4	ND	0 - 0.003	0.000596	-	0	AI

** No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.
ND = No Fibers Detected
NSS = Not Statistically Significant (1 to 4 fibers detected)

*CI = Total Chrysotile Fibers plus Bundles
*AI = Total Amphibole Fibers plus Bundles

* NAM = Non-Asbestos Mineral Fibers plus Bundles
* MMM = Man Made Mineral Fibers plus Bundles

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS

WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING

RUN 4 - 30 OCTOBER 1984

Job Number 84487

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type *
	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
ON-SITE SAMPLES											
Location 1	0.003	0.0008 - 0.007	0.000536	0.2	5	ND	0 - 0.002	0.000536	-	0	CT
	ND	0 - 0.002	0.000536	-	0	ND	0 - 0.002	0.000536	-	0	AI
Location 2	NSS	0 - 0.004	0.000592	0.01	1	ND	0 - 0.003	0.000592	-	0	CT
	ND	0 - 0.003	0.000592	-	0	ND	0 - 0.003	0.000592	-	0	AI
Location 3	NSS	0 - 0.005	0.000572	0.005	2	ND	0 - 0.003	0.000572	-	0	CT
	NSS	0 - 0.005	0.000572	0.05	2	ND	0 - 0.003	0.000572	-	0	AI
Location 4	0.005	0.002 - 0.011	0.000595	0.03	9	ND	0 - 0.003	0.000595	-	0	CT
	ND	0 - 0.003	0.000595	-	0	ND	0 - 0.003	0.000595	-	0	AI
Location 5	0.008	0.004 - 0.015	0.000599	0.3	14	NSS	0 - 0.004	0.000599	0.05	1	CT
	0.004	0.001 - 0.008	0.000599	2.7	6	ND	0 - 0.003	0.000599	-	0	AI

**No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.
ND = No Fibers Detected
NSS = Not Statistically Significant (1 to 4 fibers detected)

*CT = Total Chrysotile Fibers plus Bundles
*AI = Total Amphibole Fibers plus Bundles
*NAM = Non Asbestos Mineral Fibers plus Bundles
*MMM = Man Made Mineral Fibers plus Bundles

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS

WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING

RUN 4 - 30 OCTOBER 1984

Job Number 84487

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type *
	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
OFF-SITE SAMPLES											
Location 1	NSS	0 - 0.005	0.000568	0.02	3	ND	0 - 0.003	0.000568	-	0	CT
	NSS	0 - 0.004	0.000568	0.06	1	ND	0 - 0.003	0.000568	-	0	AT
Location 2	NSS	0 - 0.006	0.000583	0.01	3	ND	0 - 0.003	0.000583	-	0	CT
	NSS	0 - 0.005	0.000583	0.02	2	ND	0 - 0.003	0.000583	-	0	AT
Location 3	NSS	0 - 0.005	0.000599	0.02	2	ND	0 - 0.003	0.000599	-	0	CT
	NSS	0 - 0.005	0.000599	0.02	2	ND	0 - 0.003	0.000599	-	0	AT

** No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.

ND = No Fibers Detected

NSS = Not Statistically Significant (1 to 4 fibers detected)

*CT = Total Chrysotile Fibers plus Bundles

*AT = Total Amphibole Fibers plus Bundles

† NAM = Non Asbestos Mineral Fibers plus Bundles

* MMM = Man Made Mineral Fibers plus Bundles

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS
WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING
RUN 5 - 05 NOVEMBER 1984

Job Number 8448H7

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type *
	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
ON-SITE SAMPLES											
Location 1	0.008	0.004 - 0.014	0.000525	0.3	16	NSS	0 - 0.004	0.000525	0.07	2	CT
	NSS	0 - 0.005	0.000525	0.1	3	ND	0 - 0.002	0.000525	-	0	AT
Location 2	0.039	0.017 - 0.061	0.000536	3.6	73	0.003	0.001 - 0.008	0.000536	2.1	6	CT
	0.004	0.001 - 0.008	0.000536	2.9	7	NSS	0 - 0.003	0.000536	2.4	1	AT
Location 3	0.005	0.002 - 0.010	0.000504	0.8	10	NSS	0 - 0.004	0.000504	0.6	2	CT
	NSS	0 - 0.006	0.000504	0.2	4	ND	0 - 0.002	0.000504	-	0	AT
Location 4	0.004	0.001 - 0.009	0.000545	2.3	8	NSS	0 - 0.004	0.000545	2.3	1	CT
	NSS	0 - 0.004	0.000545	0.05	2	ND	0 - 0.003	0.000545	-	0	AT
Location 5	0.027	0.011 - 0.043	0.000676	1.0	40	0.004	0.001 - 0.009	0.000676	0.4	6	CT
	0.004	0.001 - 0.009	0.000676	0.8	6	ND	0 - 0.003	0.000676	-	0	AT

**No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.
ND = No fibers detected
NSS = Not Statistically Significant (1 to 4 fibers detected)

*CT = Total Chrysotile Fibers plus Bundles
*AT = Total Amphibole Fibers plus Bundles
* NAM = Non-Asbestos Mineral Fibers plus Bundles
* MMM = Man Made Mineral Fibers plus Bundles

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS

WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING

RUN 5 - 05 NOVEMBER 1984

Job Number 84

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH				
	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m³)	Number of Fibers Counted
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected		
OFF-SITE SAMPLES										
Location 1	NSS	0 - 0.004	0.000584	0.002	1	ND	0 - 0.003	0.000584	-	0
	NSS	0 - 0.006	0.000584	0.09	4	ND	0 - 0.003	0.000584	-	0
Location 2	NSS	0 - 0.004	0.000579	0.001	1	ND	0 - 0.003	0.000579	-	0
	NSS	0 - 0.006	0.000579	0.9	3	ND	0 - 0.003	0.000579	-	0
Location 3	NSS	0 - 0.004	0.000693	0.002	1	ND	0 - 0.003	0.000693	-	0
	NSS	0 - 0.008	0.000693	0.04	4	ND	0 - 0.003	0.000693	-	0

**No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.

ND = No fibers detected

NSS = Not Statistically Significant (1 to 4 fibers detected)

*CI = Total Chrysotile Fibers plus Bundles

*AI = Total Amphibole Fibers plus Bundles

* NAM = Non-Asbestos Mineral Fibers plus Bundles

* MMM = Man Made Mineral Fibers plus Bundles

SUMMARY OF RESULTS OF ANALYSES FOR ASBESTOS

WAUKEGAN LANDFILL AMBIENT ASBESTOS MONITORING

EXAMINATION OF BLANK FILTERS
(Air Volume of 10.0 m^3 Assumed for Data Processing)

Job Number 84487

Sample Description	FIBERS OF ALL LENGTHS					FIBERS GREATER THAN 5.0 MICROMETERS IN LENGTH					Fiber Type *
	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/m^3)	Number of Fibers Counted	Fiber Concentration (Fibers/mL)			Estimated Mass Concentration (Nanograms/h^3)	Number of Fibers Counted	
	Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			Mean	95% Confidence Interval	Concentration Equivalent to 1 Fiber Detected			
ON-SITE SAMPLES											
Run No. 1, Field Blank	0.007	0.003 - 0.014	0.000711	0.04	10	ND	0 - 0.003	0.000711	-	0	CT
	NSS	0 - 0.008	0.000711	0.2	4	ND	0 - 0.003	0.000711	-	0	AT
Run No. 4, Field Blank	NSS	0 - 0.007	0.000631	0.2	4	ND	0 - 0.003	0.000631	-	0	CT
	0.006	*0.003 - 0.012	0.000631	0.3	10	ND	0 - 0.003	0.000631	-	0	AT
OFF-SITE SAMPLES											
Run No. 2, Field Blank	0.004	0.001 - 0.009	0.000679	0.09	6	ND	0 - 0.003	0.000679	-	0	CT
	NSS	0 - 0.005	0.000679	0.05	2	ND	0 - 0.003	0.000679	-	0	AT
LABORATORY BLANK											
Lot Number 83Q9851	0.005	0.002 - 0.011	0.000686	0.5	8	ND	0 - 0.003	0.000686	-	0	CT
(Same Lot Number as Filter used in Field)	NSS	0 - 0.007	0.000686	0.04	3	ND	0 - 0.003	0.000686	-	0	AT

*No mean value is reported when fewer than 5 fibers were detected in the portion of sample examined.
ND = No Fibers Detected
NSS = Not Statistically Significant (1 to 4 fibers detected)

*CT = Total Chrysotile Fibers plus Bundles
*AT = Total Amphibole Fibers plus Bundles

* NAM = Non Asbestos Mineral Fibers plus Bundles
* MMM = Man Made Mineral Fibers plus Bundles

TABLE II

TSP Concentrations ($\mu g/m^3$)
Johns-Manville Company
Waukegan, Illinois

Site Number	Sampling Date		
	August 1-2, 1985	August 2-3, 1985	August 5-6, 1985
1 *	55.7	104.0	65.4
2 *	11.4	23.6	40.0
3 *	8.0	15.6	28.8
4 *	7.2	12.5	21.1
5 *	12.5	26.00	37.3
6	11.1	32.8	35.8
7	30.8	64.0	32.3
8	16.6	23.4	27.7
9	12.7	36.9	23.4
10 *	9.7	19.6	30.8

*Indicates samplers with generators

Source: "Ambient Air Quality Survey for Johns-Manville Company Waukegan, Illinois" Clayton Environmental Consultants August 26, 1985

Lead Concentrations (ug/m^3)
Johns-Manville Company
Waukegan, Illinois

Site Number	Sampling Date		
	August 1-2, 1985	August 2-3, 1985	August 5-6, 1985
1 *	0.0123	0.0497	0.0229
2 *	0.0062	0.0556	0.0361
3 *	< 0.0060	0.0426	0.0203
4 *	< 0.0060	0.0371	0.0226
5 *	0.0090	0.0206	0.0434
6	< 0.0060	0.0400	0.0212
7	0.0140	0.0778	0.0090
8	0.0530	0.1070	0.0450
9	0.0130	0.0449	0.0100
10 *	0.0110	0.0298	0.0115

*Indicates samplers with generators

Table III

SUMMARY OF MONITORING WELL TEST RESULTS

Source: Johns-Manville RI Report - Volume I KMA - July 1985

Sample or Well Number	1	2	3	3 (Duplicate)	4	5	Field Bank	Primary Drinking Water Standard
Chemical Parameter in mg/L*								
Asbestos	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	-
Thiram	<.005	<.005	<.005	<.005	<.005	<.005	<.005	-
Chromium, Total	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
Lead Total	0.014	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	0.05
Barium, Total	0.35	0.38	0.21	0.19	0.18	0.16	<0.10	1.0
Copper, Total	0.02	0.03	0.02	<0.01	<0.01	0.07	<.01	-
Arsenic, Total	0.029	0.022	0.020	0.023	0.021	<0.002	<0.002	0.05
Boron	0.97	0.71	0.41	0.34	0.35	0.28	0.47	-
Total Organic Carbon	7.2	6.8	3.1	3.1	3.5	2.8	110**	-
Iron, Total	<0.02	0.86	0.13	0.12	0.08	1.6	<0.02	-
Manganese, Total	0.15	0.20	0.09	0.09	0.02	0.21	<0.01	-
Zinc, Total	0.01	0.03	<0.01	0.01	<.01	0.24	<0.01	-
Ammonia Nitrogen as N	2.3	0.9	1.6	1.6	0.6	1.6	<0.1	-

* All other Parameters were at non-detectable levels.
** Distilled water blank was stored in a plastic container
\- Not available
N.D. Not Detected

TABLE IV

SUMMARY OF ASBESTOS RESULTS

(CHRYSOTILE FIBERS BY TEM)

Sampling Dates: April 29 and 30, 1985

Sample Description	Fibers Concentration*	Fibers Concentration*(>5u)
M.W #1	6	BDL
M.W #2	9	BDL
M.W.#3	12	BDL
M.W.#4	7.8	BDL
M.W.#4 (Replicate)	10.8	BDL
M.W. #5	7.5	BDL
Field Blank	0.2	BDL
Lake Michigan Shore (East of Well #4)	13	1.2
Lake Michigan Shore (East of Well #2)	11	0.6
Lake Michigan Shore (North of Commonwealth Edison Cooling Water Discharge)	19	BDL
Lake Michigan, Waukegan City Water Intake	5.5	0.2

* In million fibers per liter (FPL)

BDL = Below Detection Limit

Note: 1) highest detection limit was 3×10^6 FPL for M.W. #2 sample

2) Values for asbestos for MW #1 through #5 are listed as not detected in Table II. This is due to the fact that these samples were analyzed with phase contrast microscopy; whereas the asbestos results in Table III (above) were obtained by using transmission electron microscopy (TEM). Table III analyses were performed on samples obtained during an additional round of sampling subsequent to the sampling round for Table II.

Client Kumar Malhotra + Assoc. Inc.

Sample Description Blank EMS Lab No. 6242

Chrysotile Fibers	0.01	MFL
>5 Microns Length (Chrysotile)	Below Detection Limit	MFL
Mass (Chrysotile)	2×10^{-5}	µg/L
More/Less than 5 Chrysotile Fibers in Sample	Less	
Detection Limit	0.01	MFL

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	1	0	0	0	0	0

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	0	1	0	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	1	0	0	0	0	0

pages 2-13 adopted from: Johns-Manville RI Report - Volume II

2/13

Client Kumar Malhotra + Assoc. Inc.

Sample Description Well #1 EMS Lab No. 6242

Chrysotile Fibers	6	MFL
>5 Microns Length (Chrysotile)	Below Detection Limit	MFL
Mass (Chrysotile)	0.05	µg/L
More/Less than 5 Chrysotile Fibers in Sample	Exactly Five	
Detection Limit	1.2	MFL

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	1	2	1	1	0	0

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	0	4	1	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	1	3	1	0	0	0

3/13

EMS Laboratories

Client Kumar Malhotra + Assoc. Inc.

Sample Description Well #2 EMS Lab No. 6942

Chrysotile Fibers	9	MFL
>5 Microns Length (Chrysotile)	Below Detection Limit	MFL
Mass (Chrysotile)	0.02	µg/L
More/Less than 5 Chrysotile Fibers in Sample	Less	
Detection Limit	3	MFL

-J-8-

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	2	1	0	0	0	0

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	1	2	0	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	2	0	0	1	0	0

4/13

EMS Laboratories

Client Kumar Malhotra + Assoc. Inc.

Sample Description Well #3 EMS Lab No. 6242

Chrysotile Fibers	12	MFL
>5 Microns Length (Chrysotile)	Below Detection Limit	MFL
Mass (Chrysotile)	0.1	µg/L
More/Less than 5 Chrysotile Fibers in Sample	More	
Detection Limit	1.5	MFL

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	2	2	1	2	0	1

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	0	8	0	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	2	2	1	2	1	0

Client Kumagai Leatra + Assoc. Inc.

Sample Descript. Well #4 EMS Lab No. 6242

Chrysotile Fibers	7.8	MFL
>5 Microns Length (Chrysotile)	Below Detection Limit	MFL
Mass (Chrysotile)	0.05	µg/L
More/Less than 5 Chrysotile Fibers in Sample	More	
Detection Limit	0.6	MFL

J-10

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	4	5	1	1	1	1

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	2	11	0	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	4	3	4	1	0	1

6/13

Client Kumar Malhotra + Assoc. Inc.

Sample Description Well #4-A EMS Lab No. 6242

Chrysotile Fibers	10.8	MFL
>5 Microns Length (Chrysotile)	Below Detection Limit	MFL
Mass (Chrysotile)	0.08	µg/L
More/Less than 5 Chrysotile Fibers in Sample	More	
Detection Limit	0.6	MFL

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	3	8	3	2	2	0

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	1	15	2	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	6	7	2	1	2	0

Client Kumar Malhotra + Assoc. Inc.

Sample Description Well # 5 EMS Lab No. 6242

Chrysotile Fibers	7.5	MFL
>5 Microns Length (Chrysotile)	Below Detection Limit	MFL
Mass (Chrysotile)	0.02	µg/L
More/Less than 5 Chrysotile Fibers in Sample	Exactly Five	
Detection Limit	1.5	MFL

J-12

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	1	4	0	0	0	0

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	1	4	0	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	1	3	1	0	0	0

8/13

EMS Laboratories

Client KUMAR MALHOTRA + ASSOC., INC.

Sample Description EAST OF WELL #4 EMS Lab No. 6242

Chrysotile Fibers	13	MFL
>5 Microns Length (Chrysotile)	1.2	MFL
Mass (Chrysotile)	0.1	µg/L
More/Less than 5 Chrysotile Fibers in Sample	MORE	
Detection Limit	1.2	MFL

J-13

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	1	8	1	0	0	1

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	2	5	4	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	4	4	0	2	0	1

EMS Laboratories

Client KUMAR MALHOTRA + ASSOC., INC.

Sample Description EAST OF WELL #2 EMS Lab No. 6242

Chrysotile Fibers	11	MFL
>5 Microns Length (Chrysotile)	0.6	MFL
Mass (Chrysotile)	0.1	µg/L
More/Less than 5 Chrysotile Fibers in Sample	MORE	
Detection Limit	0.6	MFL

J-14

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	1	9	5	2	0	1

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	3	13	1	1	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	4	7	4	1	0	2

12/13

EMS Laboratories

Client KUMAR MALHOTRA + ASSOC., INC.

Sample Description NORTH OF COMMONWEALTH EDISON EMS Lab No. 6242

Chrysotile Fibers	19	MFL
>5 Microns Length (Chrysotile)	BELOW DETECTION LIMIT	MFL
Mass (Chrysotile)	0.2	µg/L
More/Less than 5 Chrysotile Fibers in Sample	MORE	
Detection Limit	1.2	MFL

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	2	7	4	2	1	0

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	1	13	2	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	2	8	3	2	1	0

11/13

EMS Laboratories

Client KUMAR MALHOTRA + ASSOC., INC.

Sample Description LAKE WATER INTAKE

EMS Lab No. 6242

Chrysotile Fibers	5.5	MFL
>5 Microns Length (Chrysotile)	0.2	MFL
Mass (Chrysotile)	0.04	µg/L
More/Less than 5 Chrysotile Fibers in Sample	MORE	
Detection Limit	0.2	MFL

J-16

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	6	9	4	0	1	3

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	0	21	2	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	7	8	4	0	2	2

12/13

Client Kumar Malhotra + Assoc., Inc.

Sample Description Field Blank EMS Lab No. 6242

Chrysotile Fibers	0.2	MFL
>5 Microns Length (Chrysotile)	Below Detection Limit	MFL
Mass (Chrysotile)	2×10^{-3}	µg/L
More/Less than 5 Chrysotile Fibers in Sample	More	
Detection Limit	0.03	MFL

SIZE DISTRIBUTION
(Chrysotile Only)

Particle Length - Microns

	0-0.49	0.50-0.99	1.00-1.49	1.50-1.99	2.00-2.49	2.5 up
No. of Particles	2	1	4	0	0	1

Particle Width - Microns

	0-0.04	0.05-0.09	0.10-0.14	0.15-0.19	0.20-0.24	0.25 up
No. of Particles	0	8	0	0	0	0

Aspect Ratio L/W

	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50 up
No. of Particles	3	1	3	0	0	1

13/13

Table V
Results of Soil Analyses

SUMMARY OF RESULTS OF CHEMICAL ANALYSIS

BORING NUMBER	B-1			B-2			B-3				B-4				B-5
Boring Depth in Feet	Near Surface	14-15.5	31.5-33.0	Surface	21.5-23.0	34-35.5	Surface	Near Surface	39.5-40	Field Blank	Near Surface	6.5-8.0	14-15.5	At 20	
Chemical Parameter (mg/kg)															
Chromium, Total	16	29	9	81	42	6.6	23	12	6.1	3.8	4.4	25	5.8	1.3	
Lead, Total	86	3700	630	1100	2600	190	4700	1300	13	2.4	22	1400	140	8.2	
Ashestos %	< 1	<1	<1	<1	<1	<1	<1	<1	<1	0	<1	<1	<1	<1	
Toluene (U220)	< .02	.31	0.14	-	0.51	-	-	-	-	-	0.31	-	0.62	-	
Ethyl Benzene	< .02	-	-	-	.08	-	-	-	-	-	-	-	1.4	-	
Di-N-Butylphthalate	< .028	0.31	0.74	-	1.2	0 28	-	-	-	0.53	0.31	0.14	0.26	-	
1,2-Dichlorobenzene (U070)	0.12	0.27	-	0 58	0.78	-	<.028	-	-	-	-	-	0.20	-	
1,3-Dichlorobenzene (U071)	< .028	-	-	0.077	0.061	-	-	-	-	-	-	-	-	-	
Bis(2-Ethylhexyl) Phthalate (U028)	3.6	2.5	3.3	4.6	14	5.1	-	-	-	24	8.9	3.5	4.2	-	
Di-N-Octyl Phthalate (U107)	< .028	0.55	0.49	-	1.5	3.3	-	-	0.064	9	1.7	1.0	0.52	-	
Fluorene	< .028	0.051	-	-	0.18	-	-	-	-	-	.077	-	0.43	-	
Fluoranthene	0.12	0.053	0.035	0.005	0.33	0.20	0.088	<.028	-	-	.093	-	0.34	-	
Pyrene	0.13	0.089	0.043	0.098	0.30	0.19	0.092	0.16	-	-	-	.046	0.33	-	
Phenanthrene	0.046	0.16	<.055	0.19	0.56	0.06	0.16	0.10	-	-	0.15	0.062	0.57	-	
Anthracene	< 0.028	0.037	-	-	0.15	<0.028	0.040	0.084	-	-	-	-	.092	0.032	
Benzo (A) Anthracene	< 0.028	-	-	-	-	0.20	0.045	0.074	-	-	-	-	-	-	
Naphthalene (U165)	0.054	0.78	0.089	0.050	1.8	<.028	0.095	0.057	-	-	0.95	0.097	2.1	-	
p-Chloro-m-Cresol (U039)	0.42	1.0	<0.02	-	0.47	-	-	-	-	-	-	-	-	-	
Pentachlorophenol (U242)	< 0.3	-	-	-	-	-	6.5	-	-	-	-	-	-	12	
2,4,6 Trichloro Phenol (U231)	< 0.03	-	-	-	0.45	-	-	-	-	-	-	-	-	-	
PCB 1254	0.2	0.2	<0.1	0.3	0.2	-	0.2	-	-	-	-	-	-	-	
Thiram	< 0.028	-	-	-	-	-	-	-	-	-	-	-	-	-	

- Non Detectable

Source: Johns-Manville RI Report-Volume I
KMA - July 1985

CONTINUED —

SUMMARY OF RESULTS OF CHEMICAL ANALYSIS

BORING NUMBER	B-6					B-7					B-8		B-9			B-10		
Boring Depth in Feet	Surface	Near Surface	11.5-13.0	24-25.5	Field Blank	Near Surface	Near Surface Replicate	16.5 18.0	16.5 18.0 Replicate	29-30.5	At 20	Near Surface	9.0-10.5	29-30.5	Near Surface	At 20	Field Blank
Chemical Parameter (mg/kg)																	
Chromium, Total	29	5.4	18	6.4	3.6	22	18	14	18	1.8	1.3	28	26	3.8	8.2	4.8	1.2
Lead, Total	2200	330	2000	3900	< 1.0	82	129	< 1.0	-	-	5.4	250	28	6	20	9.6	-
Asbestos %	<1	< 1	<1	<1	0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0
Toluene (U220)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl Benzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DI-N-Butylphthalate	0.27	0.18	0 21	0.12	0.21	(33	0.24	0.30	0.18	-	-	-	-	0.054	-	-	-
1,2-Dichlorobenzene (U070)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene (U071)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-Ethylhexyl) Phthalate (U028)	5.2	4.0	72	4.2	81	120	8.8	5.9	-	-	-	-	-	-	-	1.3	3.1
DI-N-Octyl Phthalate (U107)	-	2.5	30	1.9	47	56	9.3	4.4	0.59	0.58	-	0.40	0.20	0.31	-	-	1.(
Fluorene	-	.032	0.10	0.031	-	-	0.14	-	-	-	-	-	-	-	-	-	-
Fluoranthene	0.28	0.50	0.14	0.12	-	0.29	0.14	-	-	-	-	0.64	-	-	-	-	-
Pyrene	0.33	0.48	0.14	0.11	-	0.35	0.18	-	-	-	-	0.44	-	-	-	-	-
Phenanthrene	0.18	0.59	0.19	0.27	-	0.40	0.27	-	-	-	-	0.27	-	0.12	-	-	-
Anthracene	.051	0.21	0.10	-	-	0.11	.082	-	-	-	-	0.20	-	0.048	-	-	-
Benzo (A) Anthracene	0.23	0.42	-	-	-	14	0.082	-	-	-	-	0.20	-	-	-	-	-
Naphthalene (U165)	0.22	0.16	0.10	0.26	-	0.15	0.16	-	0.20	-	-	-	-	0.56	-	-	-
p-Chloro-m-Cresol (U039)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol (U242)	-	-	-	-	-	-	-	-	-	-	19	30	27	-	7.9	-	-
2,4,6 Trichloro Phenol (U231)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PCB 1254	-	-	0.4	-	-	0.90	2.0	-	-	-	-	0.40	-	-	-	-	-
Thiram	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- Non Detectable

TABLE VI

CONTAMINANT PATHWAYS

CONTAMINANT	MEDIA OF TRANSPORT	CONSIDERATIONS
Asbestos	Air, Surface Water	Air transport can result in subsequent contamination of surrounding soils and Lake Michigan waters and surface waters north of the site.
Lead	Air, Ground Water, Surface Water, Soil	Lead tends to be transported through the air while adhering to soil particles; Ground Water lead contamination may result in contamination of Lake Michigan waters; due to present alkaline soil/waste conditions, lead is not likely to move with site ground water.
Chromium	Same as lead	Same as lead
Xylene, trace Organics	Air, Ground Water, Surface Water	Organics disposed of at the site are not expected to persist in surface water; other organics, such as PCBs, detected in site soil samples are not expected to migrate off-site.

TABLE VII

POTENTIAL RECEPTORS

MEDIUM	POLLUTANTS	RECEPTORS	FORM OF CONTACT
Air	Asbestos, Lead, Chromium, Xylene	Residents located west of the site, workers on and around the site, wildlife in Illinois Beach State Park and around the site.	Inhalation, skin contact (except organics)
Ground Water	Lead, Chromium Xylene	No receptors located down-gradient of the site. Ground water interfaces with Lake Michigan and surface waters north of the site.	Ingestion
Surface Water	Asbestos, Lead, Chromium, Xylene	Residents using Lake Michigan recreationally, aquatic life in Lake Michigan and Illinois Beach State Park, wildlife in Illinois Beach State Park and around site.	Direct Contact, Ingestion
Soil	Lead, Chromium	Workers on and around site, wildlife around site.	Direct Contact, Ingestion

TABLE VIII

CAPITAL AND O & M COSTS OF

RECOMMENDED ALTERNATIVE

SOURCE: JOHNS-MANVILLE FS REPORT

KMA - DECEMBER 1986

ALTERNATIVE III: SOIL COVERING WITH VEGETATION

COST ESTIMATES

1. Estimated Capital Costs:

Item	Units	Quantity	Unit Cost ($)	Total Cost ($)
Mobilization, set-up, & other fixed costs (1)	LS	Job	80,000	80,000
Clearing & Grubbing	Acre	70	500	35,000
Excavating & Grading				
Balance cut & fill	CY	30,330	6.00	182,000
Extra Fill	CY	21,000	6.00	126,000
Roadways Cover Soil	CY	26,000	7.00	182,000
Cover Soil (15" thick)	CY	125,000	6.50	812,500
Top Soil (3" thick)	CY	28,000	9.00	252,000
Gravel Roadways				
Heavy Traffic Roadways (8" gravel over 24" cover)	LF	8,400	20.00	168,000
Light Traffic Roadways (4" gravel over 24" cover)	LF	9,200	5.00	46,000
Drainage Structures				
Northeast Ditch	LS	Job	55,000	55,000
Southeast Ditch	LS	Job	31,000	31,000
Slope Protection				
Settling Basins	SY	6,100	13.00	79,300
Paper Mill Effluent & Flex Board Effluent Catch & Mixing Basins	SY	6,100	13.00	79,300
Collection Basin	SY	1,200	13.00	15,600
East Ditch (Upstream Face)	LS	Job	25,000	25,000
East Ditch (Downstream Face)	LS	Job	50,000	50,000

ALTERNATIVE III: SOIL COVERING WITH VEGETATION

Item	Units	Quantity	Unit Cost ($)	Total Cost ($)
Drainage				
Dike Drainage (French Drains with filter fabric)	LF	2,000	21.00	42,000
Drainage Ditches	LF	11,000	4.00	44,000
Misc Drainage Structures	LS	Job	10,000	10,000
Hydromulch	AC	70	3,000	210,000
Pond dredging & misc site cleanup (2)	LS	Job	200,000	200,000
Water sprays for dust supressing	Day	125	400	50,000
Sub-Total				$2,774,700
Engineering	LS	Job	120,000	120,000
Construction Management Including chemical analysis of borrowed fill & top soil	LS	Job	400,000	400,000
Sub-Total				$3,294,700
Contingencies (10%)				329,470
TOTAL CAPITAL COST				$3,624,170

2. Estimated Operation & Maintenance Costs:

Groundwater and surface water monitoring (once/year)	$14,000
Labor and material for soil cover and vegetation and roadway maintenance	25,000
Administration and Contingency Costs	10,000
TOTAL OPERATION & MAINTENANCE COST	$49,000

3. Present Worth Analysis:

Present Worth of Capital Cost	$3,624,170
Present Worth of Operation & Maintenance Cost	461,900
TOTAL PRESENT WORTH	$4,086,090

ALTERNATIVE III: SOIL COVERING WITH VEGETATION

(1) Includes temporary fencing, site security, health & safety & environmental monitoring., and decontamination facilities for heavy equipment.

(2) Includes fencing along eastern site boundry, additional signs, beach cleanup a black ditch renovation and monitoring well installation.

ALTERNATIVE III: DEVIATIONS

The operation and maintenance cost of the deviations is estimated to be the same as for the primary alternative. The estimated capital costs of the 24" cover and 30" cover alternatives are as follows:

(i)	24" Cover Alternative	
	Added construction cost of 6" additional cover soil (50,000 cu.yd. @$6.50/cu yd)	$325,000
	Added construction management	40,000
	Added contingencies	36,500
	Sub-Total	$401,500
	Capital cost of the primary alternative	3,624,170
	Total Capital Cost	$4,025,670
	Present worth of capital cost	4,025,670
	Present worth of O & M cost	461,920
	TOTAL PRESENT WORTH	$4,487,590
(ii)	30" Cover Alternative	
	Added construction cost of 12" additional cover soil (100,000 cu.yd. @ 6.50/cu yd)	$650,000
	Added construction management	80,000
	Added contingencies	73,000
	Sub-Total	$803,000
	Capital cost of the primary alternative	3,624,170
	Total Capital Cost	$4,427,170
	Present worth of capital cost	4,427,170
	Present worth of O & M cost	461,920
	TOTAL PRESENT WORTH	$4,889,090

TABLE IX

PURPOSES OF O & M ACTIVITIES INCLUDED

IN RECOMMENDED ALTERNATIVE

O & M ACTIVITY	PURPOSE
Soil Cover Monitoring Program	To ensure that no asbestos reaches the surface of the covering layer and becomes releasable to the air in the future.
Air Monitoring Program	To ensure that any asbestos, lead, chromium, or TSP (PM_{10}) leaving the site via the air pathway is detected.
and	
Contingency Plan	To ensure that appropriate remedial action will be taken if concentrations of the above contaminants that would pose a threat to public health and the environment are detected.
Contingency Plan for Sludge Disposal	To ensure that appropriate remedial sludge is dredged in the future and disposed of on-site.
Ground Water Detection Monitoring System and Contingency Plan	To ensure that any contaminants that leach from the site are detected. To ensure that appropriate remedial action will be taken if contaminant concentrations that would pose a threat to public health and the environment are detected.

Appendices

APPENDIX I

ENFORCEMENT ANALYSIS

Negotiations with the PRP, Manville, have been concluded. U.S. EPA is presently preparing to file a complaint for an affirmative injunction requiring Manville to implement U.S. EPA's recommended alternative. It is possible that the post-referral negotiations will be successful and that Manville will enter into a Consent Decree with U.S. EPA to conduct the Remedial Design/Remedial Action.

Manville and U.S. EPA are in agreement that the soil covering with vegetation alternative is the most cost-effective remedy. There are many facets to the soil covering with vegetation remedy, including a ground water detection monitoring system and contingency plans for sludge disposal and ground water contamination. The only major dispute between Manville and U.S. EPA is the thickness of soil cover to be applied to the dry disposal areas at the site, which is basically a disagreement regarding the level of protection from airborne asbestos provided to public health and the cost of said protection. Considering Manville's last proposal prior to the close of formal negotiations, the dispute involves a difference of three inches of cover for the site, with a resultant cost differential of only $200,000, or approximately five percent of the total cost of the remedy. This is why U.S. EPA believes that the case could be settled prior to going to trial.

U.S. EPA will exhibit little or no flexibility in negotiations regarding the level of protection from airborne asbestos to be provided to public health and the environment, and since this is the only major dispute regarding the recommended alternative, U.S. EPA's post-referral negotiating position is well-defined.

Appendix II

Responsiveness Summary

RESPONSIVENESS SUMMARY
JOHNS-MANVILLE CORPORATION SITE
WAUKEGAN, ILLINOIS

U.S. ENVIRONMENTAL PROTECTION AGENCY

JUNE 1987

RESPONSIVENESS SUMMARY

JOHNS-MANVILLE CORPORATION SITE * WAUKEGAN, ILLINOIS

The U.S. Environmental Protection Agency (U.S. EPA) has gathered information on the types and extent of contamination found, evaluated remedial measures, and recommended a remedial action at the Johns-Manville Corporation (J-M) site in Waukegan, Illinois.

As part of this process, a public meeting was held to explain the intent of the project, to describe the results, and to receive comments from the public.

Public participation in Superfund projects is required in the Superfund Amendments and Reauthorization Act of 1986 (SARA). Comments received from the public are considered in the selection of the remedial action for the site. This document summarizes the comments received and describes how they were incorporated into the decision-making process.

This community relations responsiveness summary has three sections:

* Section 1.0 Overview. This section discusses the U.S. EPA's recommended alternative to remedy the potential for human and environmental exposure to contaminated soil and airborne particulate matter at the Johns-Manville site.

* Section 2.0 Background on Community Involvement. This section describes a brief history of community relations activities conducted by U.S. EPA and concerns raised by the community during remedial planning activities.

* Section 3.0 Summary of Public Comments Received and U.S. EPA Responses. Both oral and written comments are grouped by topic. U.S. EPA responses to these comments will follow each topic.

  Appendix A U.S. EPA response to comment No. 3, under Remedial Alternatives.

  Appendix B Complete list of responders.

  Appendix C Copies of written comments submitted to U.S. EPA during public comment period.

Appendix D Verbatim public meeting transcript. The transcript covers the final minutes of the Agency presentation to the public and all the comments and questions received; the court reporter did not attend the presentation portion of the meeting.

1.0 OVERVIEW

Through vehicles such as an information repository, a fact sheet, a news release and public meeting, the U.S. EPA presented the community of Waukegan, Illinois with five alternatives (including a no action alternative) as possible remedial actions for the Johns-Manville site.

Of these, U.S. EPA has recommended that the soil cover with vegetation alternative be implemented. This alternative involves grading waste materials and soil over designated dump basins, and laying a minimum of 24 inches of compacted clean soil and top soil cover, fertilizing and seeding. This alternative is expected to eliminate the potential for on-site airborne contaminants and direct contact with waste materials. It also provides some protection to groundwater from potential contamination by leachates. This recommendation reflects U.S. EPA's goal of selecting a cost-effective yet comprehensive and effective solution to the contamination problem now present at the Johns-Manville site. The estimated cost of the recommended alternative is $4.5 million.

2.0 BACKGROUND OF COMMUNITY INVOLVEMENT AND CONCERNS

According to the Community Relations Plan for the site, limited concern has been expressed about the Johns-Manville site. This has been attributed, in part, to the considerable and sustained interest expressed in the Outboard Marine Corporation site, also in Waukegan.

The Waukegan News-Sun has reported periodically on Superfund activities at the Johns-Manville site. Most other news coverage has been of the Johns-Manville bankruptcy proceedings.

A consent order between U.S. EPA and the Manville Corporation, under which the company was required to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the site, was issued for public comment in June 1984. The comment period was extended by 30 days to the end of July 1984.

Two comments were received during this time. They were submitted by the Lake County Economic Development Commission (LCEDC) and a local charter service. LCEDC asked that Superfund money be used to quickly respond to the site. U.S. EPA responded that J-M would use its own funds, rather than Superfund money to conduct the activities in the consent order, and that the order represented expeditious progress. The charter service requested that the investigation be expanded to include areas of up to ten miles from the site and that dust from the site be controlled. U.S. EPA responded that there was no evidence of contamination beyond Johns-Manville's property, but if the investigation found additional areas of contamination, Johns-Manville would be expected to respond. Also, U.S. EPA said the order required Johns-Manville to control dust from the site.

Overall, few concerns were expressed during the RI/FS. Community Relations activities conducted during the RI/FS are listed in Table 1.

3.0 PUBLIC COMMENTS AND U.S. EPA RESPONSE

Comments raised during the public comment period are summarized below. The comment period was held from Feb. 2, 1987 to Feb. 24, 1987 to receive comments from the public on the proposed remedial alternatives for the site. The comments received during the comment period and public meeting held Feb. 9, 1987 are categorized by these topics:

- Preferred Remedial Alternative
- Technical Aspects of the Remedial Alternatives
- Cost/Funding Issues
- Remaining Concerns or Comments

Preferred Remedial Alternative

1. One resident (J. Hoff, Meeting Transcript p.21) commented that instead of the recommended alternative, an investigation should be made as to whether the PCB contaminated material in the Waukegan harbor can be used to fill the basins at the Johns-Manville site. He feels this might solve the worsening drinking water problem in the area and would save money.

U.S. EPA RESPONSE: The PCB-contaminated sediments from Waukegan Harbor would not make suitable fill material at the Johns-Manville site. The hazards from moving the sediment to the Manville property probably would be high, even though the distance is not far. In addition, cover material would have to be put over the sediments if they were used for fill, because there are risks from contact with the PCBs, just as there are with asbestos. Also, there are federal regulations governing how PCBs can be disposed of; depositing PCB-contaminated sediments from the harbor into the Manville basins would not meet those regulations.

2. Several groups who submitted written comments (International Chemical Workers Union, Local No. 60 and the Lake County Health Department) fully support the U.S. EPA recommended alternative. Both groups stated the alternative is the most suitable solution and that it adequately prevents contaminants from gaining access to the environment. The League of Women Voters, Waukegan-Zion and Lake County chapters, also support U.S. EPA's alternative and expressed additional support for fencing the east side of the site and conducting ongoing air and groundwater monitoring.

U.S. EPA RESPONSE: U.S. EPA acknowledges the comments of these groups supporting a soil cover over the site to prevent airborne contamination. The Record of Decision (ROD) calls for a 24-inch soil cover. The ROD also requires a fence and warning signs on the east side of the site, and groundwater monitoring for at least 30 years. The ROD requires that the cover be inspected to ensure that the cover is intact and that no asbestos containing wastes are near the surface of the cover. Based on the League's comment, air monitoring for asbestos, lead, chrome, and total suspended particulates (TSP) has been included in the requirements of the ROD. In addition, the ROD requires that contingency plans be developed for the remedial action: EPA has included, in the ROD, a contingency plan for air contamination to ensure that appropriate remedial action will be taken if monitoring indicates that levels of contaminants in the air pose a threat to public health and the environment directly downwind from the site. In addition, U.S. EPA has added sampling of active waste piles, in response to these and other comments received concerning long-term monitoring of the site (See Response No. 4).

2a. The Lake County Health Department requested that groundwater monitoring results generated during the remedial action be shared with the department.

U.S. EPA RESPONSE: The U.S. EPA will provide copies of the groundwater monitoring results to the Lake County Health Department and to the site public information repository at the Waukegan Public Library.

3. The Manville Corporation commented (in a letter from its legal counsel) that it strongly disagrees with U.S. EPA's recommended alternative of a 24-inch soil and vegetative cover, and commented that Manville's 18-inch recommendation is both technically and legally appropriate. Manville stated there is virtually no significant difference between the two alternatives. Manville also commented that U.S. EPA's decision for a 24-inch cover is without basis and its supporting analysis is both flawed and inconsistent.

U.S. EPA RESPONSE: A detailed U.S. EPA response to these comments by Johns-Manville is located in Appendix A of this document.

4. One citizen who attended the public meeting (H. Bogdala, p.15) does not believe the recommended alternative will be lasting.

U.S. EPA RESPONSE: The U.S. EPA recommended alternative is a multi-faceted approach to remediation of the contamination at the Johns-Manville site. All contaminant pathways are addressed, and provisions are included to ensure the long term remediation of contamination through these pathways. In order to eliminate airborne contamination and direct contact with waste materials and contaminated soils, a 24-inch cover, with vegetation, will be applied over all inactive areas of the waste disposal area, including the asbestos disposal pit, which will be closed in June 1989. Although difficult to determine accurately, it is expected that the cover will prevent asbestos-containing and other wastes from being released to the air for at least 100 years. The soil cover is also expected to reduce TSP levels in air and asbestos levels in Lake Michigan waters. A cover monitoring/maintenance program will be developed to ensure that no asbestos or other contaminants reach the surface of the covering layer and are released to the air in the future.

In response to comments received during the public comment period, an air monitoring program has been added to the recommended alternative to determine the effectiveness of the recommended alternative with respect to asbestos, lead, chromium, and TSP air emissions; a contingency plan will be developed to ensure that appropriate remedial action will be taken if concentrations of the above contaminants which pose a threat to public health and the environment are detected. Air monitoring will be performed until U.S. EPA

determines that there is no further threat of releases of contaminants to the air.

After completion of the remedial action, sludge disposal activities on site pose the only possibility of emitting asbestos to the air. A plan will be developed to ensure that asbestos-containing sludge is neither dredged nor deposited on site; it should be noted that asbestos is no longer used in manufacturing activities at Manville and is therefore no longer deposited in the facility's waste water treatment system.

A groundwater/surface water detection monitoring system will be established to ensure that any contaminants that leach from the site are detected. Analyses will be performed for a minimum of 30 years; after that time, the need for further monitoring will be evaluated, and appropriate monitoring requirements will be established by U.S. EPA. A contingency plan will be developed to ensure that appropriate remedial action will be taken if contaminant concentrations that pose a threat to public health and the environment are detected.

Surface water will flow into the remaining on site pits, the wastewater treatment system, or will be collected in peripheral ditches and channeled to the industrial canal; thus, no direct surface water discharge will occur from the site. Regarding Lake Michigan waters, three surface water sampling locations will be established in Lake Michigan as part of the groundwater/surface water detection and monitoring system. The contingency plan for groundwater/surface water will address contamination in Lake Michigan. With respect to arsenic levels in Lake Michigan (See Appendix A response), a thorough investigation of the potential source of this contamination will be conducted, and asbestos levels in Lake Michigan will be monitored to determine whether the soil cover is sufficient to remediate the asbestos problem in Lake Michigan. If it is not, the contingency plan will address this situation.

Finally, in reference to this comment, as well as others received during the public comment period, a program for sampling the waste disposal areas at Manville that will remain active after remedial action is completed at the site will be established to determine what hazardous materials, if any, continue to be disposed of in the waste disposal area. It has been Manville's contention that no hazardous wastes are presently disposed of at the site, with the exception of friable asbestos; this sampling program will check the validity of this statement.

5. One resident (S. Kaiser, p.24) expressed a wish to see the site restored to its original (natural) state, as it appeared before industrial use. He would like an easement to the public park areas north and east of the site, and feels local residents should be able to utilize the landscaped areas of the site for picnics, hikes and scenic vistas.

U.S. EPA RESPONSE: Restoring the site to its natural state is not feasible for several reasons. The site is elevated with respect to the surrounding land; thus, to restore it would require the removal of all waste materials. This concept is similar to the landfilling alternatives that were developed in the FS. In the short term, the landfilling alternatives involve extensive excavation and construction activities which disturb the waste materials and soils and allow contaminants to become airborne. Basically, when dealing with asbestos, it is undesirable to disturb the waste materials and soils. In this respect, the other alternatives (no action, grading and seeding, and soil covering with vegetation) are more desirable. The landfilling alternatives, cost order of magnitude more than soil covering and offer no advantage over soil covering with respect to long-term protection provided to public health and the environment. Lastly, to restore the site entirely to its original condition, Manville would be forced to transfer all of its wastes presently handled by the wastewater treatment system, sludge disposal pit, and miscellaneous disposal pit off site. This creates the potential for a transportation accident involving hazardous wastes and is not preferable to allowing Manville to operate only what is necessary to handle its present, non-hazardous waste disposal needs, as in the soil covering alternative.

Technical Aspects of the Remedial Alternatives

1. Some confusion still exists about the health hazards associated with site contaminants. One individual (H. Bogdala, p.14) wants to know whether there are definite health hazards present and what these health hazards are.

U.S. EPA RESPONSE: The RI indicated that, during RI sampling, elevated levels of asbestos fibers were detected on site. The RI sampling effort did not allow a determination of whether, and to what extent, airborne asbestos leaves the site. Therefore, the RI did not thoroughly characterize the health hazards associated with airborne asbestos at the site. The RI did, however, indicate that, during RI sampling, on site levels of total suspended particulates (TSP) potentially exceeded the secondary National Ambient Air Quality Standard (NAAQS) for TSP on several occasions and the primary NAAQS on one occasion (30 total samples were taken from 10 locations).

On site lead levels were well within the primary and secondary NAAQS for lead. The primary NAAQS were established to protect public health, and the secondary, to ensure welfare. During RI sampling, asbestos and arsenic levels in Lake Michigan waters exceeded applicable water quality criteria based on one in one million excess cancer risk. In summary, the RI did not allow a determination of the health effects associated with airborne asbestos and indicated that on site TSP levels are of concern from the standpoint of public health and welfare; on site lead levels are well within the applicable air standards designed to protect public health and welfare; and asbestos and arsenic levels in Lake Michigan exceeded applicable health-based water quality criteria. It should be pointed out that there is presently no indication that arsenic contamination is attributable to site activities.

Sampling conducted for U.S. EPA on April 28, 1982 by Ecology and Environment, Inc. indicated that elevated levels of asbestos fibers were present both on site and downwind from the site during the sampling effort. However, no health assessment was performed based on this data.

Based on the results of the April 1982 sampling by Ecology and Environment, the RI results, and present site conditions, U.S. EPA is recommending a course of action that will prevent any future releases of asbestos and other contaminants to the air, thus eliminating any potential adverse health effects from the site, including continued loading of asbestos into Lake Michigan. The recommended alternative will also ensure effective monitoring of asbestos and arsenic levels in the groundwater and surface water (Lake Michigan) and remediation of the groundwater and surface water at the site if levels of contamination that would pose (or, in the case of asbestos and arsenic, continue to pose) a threat to public health and the environment are detected.

Under the Superfund Amendments and Reauthorization Act of 1986, the Agency for Toxic Substances and Disease Registry is required to conduct a health assessment of every site on the National Priorities List. U.S. EPA will provide a copy of that health assessment to the Lake County Health Department and the site information repositories at the Waukegan Public Library when the assessment is available.

Cost/Funding Issues

1. A resident who attended the public meeting (H. Bogdala, p.20) said he felt the Superfund program was reluctant to spend money on this cleanup, and wanted to know whether there is any federal government money actually earmarked for this project.

U.S. EPA RESPONSE: The federal government is not reluctant to spend money at the Johns-Manville site. Whenever there are identifiable responsible parties able to conduct a cleanup under U.S. EPA's oversight, U.S. EPA prefers to have the responsible parties do the work. This saves the Superfund monies for sites where there are no responsible parties identified or where they cannot or, in some cases, refuse to do the work. In this case, the Manville Sales Corporation is a viable responsible party. U.S. EPA has been negotiating with Manville to have the company voluntarily conduct the remedial action outlined in the ROD under U.S. EPA and Illinois Environmental Protection Agency oversight. U.S. EPA has earmarked funds for overseeing Manville's work at the site. Negotiations thus far have been unsuccessful. Presently, U.S. EPA is determining whether to take legal action to require Manville to conduct the remedial action, or whether to set aside Superfund money to have U.S. EPA contractors do the work, and then attempt later to recover costs from Manville. If Superfund money is used to conduct the work, IEPA is required by law to contribute 10 percent of the initial costs, and to pay for the long term monitoring of the site.

2. One individual (unidentified, p.12) expressed concern over the possibility of the taxpayers shouldering the costs of cleanup should Manville drop out of sight over the next 30 years.

U.S. EPA RESPONSE: If U.S. EPA reaches an agreement with the Manville Sales Corporation, issues it an order, or obtains an injunction against it to do the cleanup work, the company is legally responsible to conduct monitoring work as far into the future as necessary. Taxpayers would shoulder the burden of the cost if Superfund paid for the cleanup and IEPA paid for the long-term maintenance (as described in the previous response) and the government was unable to recover its costs from the company.

3. Several Waukegan residents (unidentified, p.4) commented on the timeframe involved to implement the recommended alternative. These particular questions were raised: Why hasn't the remedial action started yet? and, If either Manville or U.S. EPA is going to pay for the cleanup, what is the hold up in starting the actual work?

U.S. EPA RESPONSE: As part of the CERCLA remedial process, once a site is listed on the National Priorities List, an RI/FS must be performed. The final FS Report is opened for public comment for a minimum of 21 days. Based on the FS and comments received during the public comment period, a Record of Decision (ROD) is written by U.S. EPA describing the recommended alternative for site remediation. Then a

design phase for the remedial action (recommended alternative) is initiated, and upon completion of the remedial design (RD), the remedial action (RA) is implemented. Each step of this process takes a considerable amount of time to implement.

In the case of the Johns-Manville site, a Consent Order required Manville to conduct the RI/FS. At the conclusion of the FS, a public comment period was held. This Responsiveness Summary describes how U.S. EPA incorporated the comments into its final decision, or Record of Decision (ROD), on how to address the site's problems. U.S. EPA and Manville have thus far been unsuccessful in negotiations for a Consent Decree under which Manville would have voluntarily conducted the Remedial Design and Remedial Action. U.S. EPA is now considering whether to take legal action to require Manville to do the work, or whether to have U.S. EPA contractors do the work. (If U.S. EPA contractors do the work, U.S. EPA would seek to recover its costs from Manville.) In any event, work cannot begin until the appropriate legal action is taken or U.S. EPA enters into a contract. As described in Cost/Funding Issue No. 1, U.S. EPA prefers to have the responsible parties conduct all work.

Remaining Concerns or Comments

1. One individual (H. Bogdala, p.15) feels U.S. EPA and the Illinois Environmental Protection Agency (IEPA) should get together and develop standards of (contaminant) levels. This person said he has read U.S. EPA and IEPA materials and claims they do no not have standards.

U.S. EPA RESPONSE: The IEPA's Division of Land Pollution Control began proceedings in the early 1980's to require Manville to obtain a permit to operate on site landfilling of plant wastes under State regulations. This exception to Section 21(d)(1) of the Illinois Environmental Protection Act (latest edition January 1, 1986) was pursued because of the disposal area's environmentally sensitive location in wetlands along the Lake Michigan shoreline. This action ceased when a federal order was developed to implement the Superfund RI/FS.

Throughout the feasibility study, IEPA has maintained that this waste disposal area is characterized as a Class II landfill (non-hazardous and general municipal waste) and should be "closed" according to regulations in the Illinois Pollution Control Board, Environmental Protection Act, Title 35 - Subtitle G, Chapter I, Subchapter i, Part 807; and guidance in the Waste Management Facilities Design Criteria. These documents define final cover quality and thickness, as well as post-closure monitoring requirements.

The primary goals of final cover over a landfill are to prevent direct exposure of wastes and detour infiltration of

water into the waste body and thereby limit groundwater degradation. The limited groundwater data collected by Manville's consultant during the remedial investigation did not reveal any contamination movement via that pathway. Based on this sampling work, groundwater protection has been established as a secondary objective behind upward migration of asbestos from freeze/thaw effects (See Appendix A response).

2. One individual (E. Koranda, p.38) said he appreciated the orderly process being used to solve the problem at the Johns-Manville site.

U.S. EPA RESPONSE: U.S. EPA notes the comment.

3. A retired Manville employee (F. Angeles, p.46) was involved in on site and off site sampling conducted by Johns-Manville about 20 years ago. He said test results around the fenced area of the property and on Sheridan Road showed lower levels of contaminants than in the dump areas on site. Consequently, he is not concerned about the migration of contaminants (asbestos).

U.S. EPA RESPONSE: With the exception of total suspended particulate levels which exceeded the secondary NAAQS for TSP, air sampling results from the remedial investigation generally confirm Mr. Angeles' comment in that no off site air contamination was emanating from the site. However, remedial investigation samples were not taken at locations that would allow a determination of whether airborne asbestos levels are elevated downwind from the site. U.S. EPA believes the soil cover required in the ROD will eliminate even the potential for off site contamination from airborne asbestos.

TABLE 1

Community Relations Activities Conducted
at the Johns-Manville Site

June 1984	Press release issued to announce availability of consent order for RI/FS and start of public comment period.
July 1984	Information repository established at Waukegan Public Library. Public comment period extended.
August 1985	Community interviews conducted for Community Relations Plan.
September 1985	Community Relations Plan finalized.
January and February 1987	Press release and fact sheet issued to announce availability of RI/FS. Held public comment period on remedial alternatives and the U.S. EPA recommended alternative. Public meeting held to describe RI/FS findings and to take comments.*

* Press release and fact sheet were distributed to local officials, media and residents on the site mailing list. An advertisement was published in the local newspaper to announce the public comment period and public meeting. The Illinois EPA participated in the public meeting.

APPENDIX A

U.S. EPA RESPONSE TO REMEDIAL ALTERNATIVE COMMENT NO. 3 (MANVILLE CORPORATION)

U.S. EPA RESPONSE:

For the sake of clarity, U.S. EPA's response is broken into two sections: technical issues, of which the majority of the response is provided by U.S. EPA's consultant and is attached at the end of this response, and health effects, which are addressed below.

Throughout Manville's comment letter, reference is made to the statement in the Remedial Investigation (RI) report that there was no evidence of off site migration of hazardous substances and that off site migration potential is low. The RI Report was superceded by the Feasibility Study (FS) Report, in which sweeping statements such as this were eliminated or amended. This particular statement was amended to read, "Based on monitoring data collected during and after the RI, there is no evidence of off site migration of any contaminant from the disposal area" (FS page 1-1, emphasis added). It has since been noted (in the August 26, 1985 report titled "Ambient Air Quality Survey for Johns-Manville Company, Waukegan, Illinois", written by Clayton Environmental Consultants, Inc.), that on site total suspended particulate (TSP) levels potentially exceed the primary and secondary National Ambient Air Quality Standards (NAAQS annual geometric mean) for TSP. Also asbestos and arsenic levels in Lake Michigan exceeded health-based water quality criteria (one in one million cancer risk) during RI sampling. More data is needed to determine whether the site attains the annual geometric mean TSP NAAQS.

The high asbestos levels in Lake Michigan suggest that asbestos is leaving the site through the air and depositing in Lake Michigan. The above statement in the FS has thus been amended in the ROD to reflect the above facts. The statements in the ROD reflect the conclusions that can actually be drawn from the RI data. It must be noted that, due to wind direction and climatological conditions during the asbestos air sampling program in the RI, the degree of off-site migration of asbestos through the air was not determined by the RI sampling effort. Rather, the conclusion was drawn that elevated levels of asbestos were detected on site during the RI. Therefore, the statement made on page 1-1 of the FS is correct, based on the RI data. However, sampling conducted prior to the RI indicated that elevated levels of asbestos were present downwind of the site. The Ecology and Environment, Inc. study performed for U.S. EPA on April 28, 1982 indicated that elevated levels of asbestos fibers were present both on site and downwind of the site. The fact that the April 28, 1982 sampling was

limited (one round) indicated the need for further data to verify the conclusions of this study. The RI sampling was intended to achieve this goal; however, due to wind direction and other climatological conditions, it did not.

Additionally, due to the limited number and location of groundwater monitoring wells and surface water sampling locations, and the limited sampling conducted (one round), statements made concerning off site migration of contaminants via groundwater and surface water are subject to the qualifier that such statements are based on very limited RI data.

On page two of Manville's letter, a reference is made to the RI Report and a statement that fibers in the five micron range and smaller are generally not associated with adverse health effects. Again, the FS Report supercedes the RI Report, and no such statements regarding health effects of fibers less than five microns are made in the FS Report. U.S. EPA does not make a distinction between health effects and fiber size for airborne asbestos, and statements to this effect are erroneous and were, therefore, excluded from the FS Report.

On page four, Manville makes a statement that U.S. EPA's recommended cover thickness ignores the conclusion of the legally required RI/FS process and the provisions of the only directly applicable U.S. EPA regulations, the asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP). It must be remembered that Manville conducted the RI/FS under a Consent Order, and according to Section 300.68 of the National Contingency Plan, "the appropriate extent of remedy shall be determined by the lead agency's selection of a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment." U.S. EPA is the lead agency and has selected what it considers to be the most cost-effective remedial alternative; therefore the requirements of the legally required RI/FS process have been met by U.S. EPA.

U.S. EPA does not ignore the provisions of the NESHAP for asbestos; U.S. EPA's recommended alternative exceeds the requirements of the asbestos NESHAP. The reason for this is mentioned in Manville's comment letter. In order to meet the remedial response objectives of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), freeze/thaw effects must be considered. The specific criteria used to select the 24-inch thickness recommended for the site by U.S. EPA are discussed in response to Manville's numerous technical criticisms in the attachment to this reply.

U.S. EPA strongly disagrees with Manville's statements on page nine that the site poses a minimal threat to human health in its present condition and that the site will present virtually no risk in covered condition, even if some asbestos particles might reach the surface in 100 years. It

must be remembered that the statement made in the RI concerning present site health risks was based on RI data. As previously stated, on site TSP levels potentially exceed the primary and secondary NAAQS for TSP. Also asbestos and arsenic levels in Lake Michigan waters exceeded health-based water quality criteria during RI sampling. Based on data concerning waste disposal activities at the site, arsenic does not appear to be attributable to the site; however, asbestos and TSP are.

Regarding asbestos in air, the air sampling conducted during the RI did not indicate whether elevated air levels of asbestos were present downwind of the site. All that was indicated was detectable elevated air levels of asbestos on site. No sampling has been performed subsequent to the RI. It stands to reason that if elevated levels of asbestos were detected on site, then asbestos would be leaving the site through the air. This assumption, along with the results of the April 18, 1982 sampling conducted by Ecology and Environment, Inc., support U.S. EPA's contention that asbestos is leaving the site through the air. The elevated levels of asbestos found in Lake Michigan waters also strongly support this contention. In any event, based on available data, the statement that the present threat to human health from the site is minimal cannot be justified. Such a statement could only be made after a thorough health assessment, considering extensive data on the site, is conducted. Since a comprehensive health assessment has not been done, U.S. EPA has taken necessary action leading to the proper remediation of the site, considering the extent and quality of existing site data and the hazardous nature of the contaminants of concern at the site, most notably asbestos.

Regarding Manville's statement concerning the risk associated with asbestos-containing particles reaching the surface in 100 years, failure of the cover is not an acceptable condition. Again, the hazardous nature of airborne asbestos must be considered. This is why the cover recommended by U.S. EPA is designed to minimize the potential for upward migration of waste materials. The cover monitoring program included in the recommended alternative is an added measure of protection in the event that U.S. EPA's conservative approach is not adequate. The above statement made by Manville in its comment letter appears to indicate an assumption made by Manville that failure of the cover in 100 years is acceptable. It is not.

In reference to Manville's statements about asbestos health effects on pages 9 through 12, the U.S. EPA statements in the Addendum to the FS Report were taken from "Toxic Information Series - Asbestos," Office of Pesticides and Toxic Substances, April 1980, and "Twenty Lessons from Asbestos," Dr. Irving J. Selikoff, M.D., EPA Journal, May 1984. Manville is correct in stating that the documents used to obtain the material in the U.S. EPA Addendum to the FS Report represent a conservative interpretation of

asbestos health effects data. There is conflicting evidence on the subject; however, it is and has been U.S. EPA's approach to err on the side of conservativism when dealing with contaminants with known adverse health effects, such as asbestos.

U.S. EPA's selection of remedy was not based on inflammatory evidence and the remedy selected would be the same regardless of the health effects data used. The fact remains that asbestos in air is a known carcinogen and causes other known adverse health effects. In addition, other evidence of potential adverse health effects attributable to the site (TSP in air and asbestos in Lake Michigan waters) was indicated by RI data. U.S. EPA believes that is has selected the most cost-effective remedy for the site, considering all relevant information.

U.S. EPA RESPONSE

TO

COMMENTS FROM MANVILLE CORPORATION ON U.S. EPA'S ADDENDUM TO FINAL FEASIBILITY STUDY AND PROPOSED COVER THICKNESS

by

Richard W. McGaw, P.E.
Consultant to U.S. EPA

INTRODUCTION

The Comments referred to in this document are those signed by Marvin Clumpus, P.E., Project Coordinator for Manville Service Corporation, and by John A. Zackrison, Esq., of Kirkland and Ellis, Washington D.C., dated February 24, 1987, and titled as shown above. Statements made in those Comments which question the potential hazard of off-site migration of asbestos or other substances at the Waukegan, Illinois disposal site are addressed by U.S. EPA in a separate report.

The document herin has been prepared by Richard W. McGaw, P.E., Civil Engineering Consultant to U.S. EPA, who is responsible for the recommendation of soil cover thickness at the Johns-Manville waste disposal site at Waukegan, Illinois.

It specifically addresses those portions of the Comments that refer to technical questions of frost penetration and the upfreezing of asbestos material through the soil cover. The format is such that statements appearing in the Comments which are critical of EPA's technical approach are given verbatim in the order in which they occur; the EPA response follows the statements.

GENERAL CRITICISMS

Relative to the problem of assuring that future asbestos contamination does not occur owing to the upward movement of asbestos under the action of freezing and thawing, beginning on p. 4 of the Comments several claims are made relative to EPA's technical approach. These are essentially assertions which remain unsubstantiated at this point in the Comments. Nevertheless, EPA has considered each claim carefully.

The claims are listed below exactly as they are stated; the EPA response follows.

a) "EPA's Addendum and supporting documentation is inaccurate, inconsistent, misleading and unreliable";

b) "The Addendum's upfreezing analysis is unreliable and unscientific";

c) "It uses or relies upon shifting and inconsistent thermal parameters";

d) "It makes shifting and undocumented assumptions of questionable reliability";

e) "It makes many undocumented factual claims" (i.e., claims

of fact);

f) "Its analysis of freezing depth omits the impact of frost heave";

g) "It fails explicitly to account for known variability in the parameters, and uncertainty concerning field conditions";

h) "Its use of the Modified Berggren equation, the fundamental analytical tool in the analysis, is irregular and marred by improper use of parameters (thermal conductivity values, latent heat values, and failure to correlate assumptions regarding parameters)";

i) "In short, EPA's Addendum on its face lacks scientific or technical credibility, validity, and reliability as a basis for a 24-inch cover recommendation".

EPA RESPONSE TO GENERAL CRITICISMS

The supporting documentation referred to in these claims is the Appendix to the EPA Addendum, entitled "Principles and Practice of Design of Soil Cover for Waste Asbestos in Northern Areas, with Calculation of Minimum Cover in Open Areas of the Johns-Manville Asbestos Disposal Site in Waukegan, Illinois", dated January 1987. This Appendix was prepared by the writer and describes a state-of-the-art procedure for estimating frost penetration in various types of soil and freezing climates; it is based on 30 years of personal research as a member of the U.S. Army Cold Regions Research and Engineering Laboratory in Hanover, New Hampshire (a Corps of Engineers laboratory). The writer's specialties

in this work from 1956 to 1986 were soil mechanics, thermal properties of soils, and frost heaving; he performed both theoretical and experimental studies in these subjects and authored some 30 technical reports and papers. A bibliography is available.

The EPA procedure used by the writer to estimate frost penetration, and to control the upfreezing of asbestos particles by limiting the number of freezing penetrations into the waste deposit, is standard engineering practice in cold regions design. Rather than being unreliable and unscientific, as is claimed above, it is in fact an application of the "limited subgrade frost protection" design procedure developed and used by the Corps of Engineers since about 1946. It results in an expedient and more economical cover thickness than would the more conservative "full subgrade protection" procedure which does not allow frost penetration to extend below the covering layers of soil.

Because governing regulations require a permanent cover over the waste asbestos, it is within EPA's authority to require full subgrade protection corresponding to a cover thickness sufficient to maintain the waste deposit below the maximum depth of frost penetration indefinitely. Clearly, this type of design would provide the greatest degree of protection from future airborne asbestos.

On a small site, full subgrade protection such as this may be justified. On sites with large areas to be covered,

however, such as the Waukegan site, cost is a factor which is to be weighed against the degree of protection provided. The basic difference between the cover thickness proposed by EPA and that proposed by Johns-Manville (J-M) is the degree of risk considered acceptable in dealing with asbestos, a substance known to be hazardous to health: EPA chooses to rely on proven practice that limits the number of frost penetrations into the asbestos (each of which lessens the effective degree of protection because it increases the potential for asbestos to return to the surface); J-M chooses not to limit the number of frost penetrations but to rely instead on an inventive but unproven procedure for estimating the rate of upfreezing of waste particles.

It is the J-M procedure that, in light of the consequences of being in error, is unscientific and unreliable. Whereas the EPA procedure is validated by several decades of experience and field measurements, and does not seek to extrapolate beyond known parameters, the J-M procedure is speculative, hypothetical, and lacks substantiating data.

In further response, the reference to "shifting thermal parameters" presumably relates to the allowable number of frost penetrations into the asbestos deposit being 10 per century when the covering layers are non-frost-susceptible (sands and clean gravels) and being only 5 per century when the cover is frost-susceptible (silts and clays), as proposed by J-M. The rationale here is simply that the risk of

particles reaching the surface quickly is high with a frost-susceptible soil, requiring a balancing of that risk by further limiting the number of times the asbestos becomes frozen.

EPA cannot respond to the charges of "undocumented assumptions of questionable reliability" and "undocumented factual claims" because no information is given to identify the apparent problem areas.

It is claimed that EPA's analysis of freezing depth "omits the impact of frost heave." This claim is incorrect because the Modified Berggren equation used by EPA (as well as by J-M) makes provision for the thermal properties of the frozen soil, which include the influence of frost heave on soil density, water content, thermal conductivity, and latent heat of the freezing soil.

The Berggren equation is theoretically correct only for a step-change of temperature at the surface (i.e., a rapid change of temperature which is then held constant for the remainder of the winter); consequently a lambda coefficient was added to the equation some years ago which modifies the results produced so that they are descriptive of field experience under typical climatic temperatures. This coefficient, together with an appropriate n-value, traditionally embodies all of the correction for climate required to fit the calculated results for frost penetration to true values measured in the field for various kinds of

surface conditions.

J-M's procedure using this equation appears to calculate penetration values that are consistently less by approximately 0.5 ft. than those calculated by EPA using the same thermal parameters. J-M's consultant (C. Vita) has recently indicated that his calculated values are actually the same as the EPA values but that the estimated amount of heave has then been subtracted. Presumably, this heave value is the "impact of frost heave" referred to in the claim cited above.

To subtract the heave, however, is incorrect. EPA was informed by researchers at the U.S. Army Cold Regions Research and Engineering Laboratory, who have used this equation for several decades, that the frost penetration calculated by the equation is "the thawed value" (W. Quinn); and further, "the equation is not sufficiently precise to adjust the results for the estimated heave; the lambda coefficient takes the heave into account."

The additional claim that EPA's use of this equation is "irregular and marred by improper use of parameters" is non-specific relative to the impropriety, and as such cannot be responded to other than to state that known properties of frozen soils similar to the soils proposed by J-M were utilized in all calculations made by EPA.

Finally, it is claimed that the EPA procedure does not explicitly "account for known variability in the parameters,

and uncertainty concerning field conditions." This is partially true, although the writer has previously made this accounting using Rosenblueth's method of maximums and minimums. Based on this analysis, the writer has stated several times during the course of the several meetings held by EPA to discuss these matters that the approximate combined error in penetration depth is about ±12%, or approximately ±3.0 in. Because any known error should be on the conservative (safe) side the negative error is usually not considered. Consequently, the required 24 inches of cover should be considered an expedient value, in that the true penetration depth using the same parameters could be as high as 27 inches.

SPECIFIC CRITICISMS

On pages 5 to 9, the Comment makes a series of specific claims against the EPA analysis. These claims are listed separately below for reference. The EPA response follows each claim.

a) J-M Claim: "EPA's analysis of alternative cover designs begins with a new reliability measure not previously considered in the FS or other materials. This is the potential number of times asbestos material might enter the cover in 100 years. According to the Addendum and support document, a cover should be designed to ensure that asbestos materials do not enter the covering layer more than 10 times per century (i.e., the frostline must

not enter the waste deposit (with) more than that frequency). This criterion is completely arbitrary and almost meaningless; the Addendum provides no basis for the criterion."

EPA Response: The full statement repeated above makes it clear that there was actually no confusion on J-M's part, that in fact they understood the "new" criterion as another way of stating the standard requirement of no more than 10 frostline penetrations of the waste deposit in 100 years. The essential point is that once asbestos enters the cover layer it will eventually reach the surface because of frost action; the time it takes the asbestos to move through the cover varies with the kind of soil used for the cover. It will be a very long time for a non-heaving soil such as sandy gravel, but it may be a very short time for a frost-susceptible soil such as the clayey silt being proposed by J-M for the covering soil. As noted later, a penetration frequency of 10 times per century is considered insufficiently conservative in conjunction with a full-depth highly frost-susceptible soil cover.

b) J-M Claim: "As long as materials remain covered there could be no public health consequences from movement into the cover. It is only the frequency or likelihood that materials might come to the surface within 100 years which is or can be important."

EPA Response: J-M's claim is correct so long as materials moving into the cover either cease to move further or slow to a yearly pace that maintains them within the cover for several hundred years. Unfortunately, a frost-susceptible soil such as the clayey silt proposed by J-M causes particles to move entirely through the protective cover apparently much faster than this, which eventually eliminates the protection. The likelihood that materials will come to the surface is indeed the major problem. But the full requirement is not that they remain covered for 100 years only, as J-M asserts several times (because failure of the cover has already occurred once this has taken place). On the contrary, the requirement is one of near-permanency: i.e., the first asbestos particle should not reach the surface for a period in excess of one hundred years, if at all.

c) J-M Claim: "While it states that frost penetration into waste deposits 10 times per century is the appropriate goal, when it comes to analyzing the cover design in the FS, the document (McGaw's Appendix to the Addendum) shifts to a criterion of only 5 (or no) frost penetrations per century."

EPA Response: This is true, but J-M failed to notice that 10 times per century was predicated on using a non-frost-susceptible soil (sandy gravel) for the covering material. J-M's proposal to use a frost-susceptible silt for the

cover (to reduce cost) decreases the safety of the design, as noted above; consequently, a more conservative penetration interval (5 times per century) must be applied in order to offset the lowered reliability of the cover. The required increase of required cover thickness is calculated from the square root of the ratio of freezing indices for the two frequencies, 1500/1300 = 1.154 = 1.075. That is, an increase of 7.5% in required thickness results from the application of the more conservative criterion, namely 1.3 in. for an 18-in. total cover; 1.7 in. for a 24-in. total cover. These additional thicknesses are needed only because J-M is proposing to use a frost-susceptable covering material (sandy gravel).

d) J-M Claim: "Only when the cover design is changed to include a sand layer does the support document shift back to relying on 10 frost penetrations per century as the objective."

EPA Response: This is true; the reason is that the non-frost-susceptible soil (sand) immediately adjacent to the asbestos provides a partial barrier to the movement of asbestos into the silty cover soil, allowing the criterion based on numbers of frost penetrations to be relaxed back to a value of 10 per century.

e) J-M Claim: "Had EPA bothered to do the analysis (or even consult Manville's updated calculations), it would have discovered that the 18-inch cover design is estimated to

permit excessive penetrations less than ten times per century, based on the thermal properties used by McGaw in his analysis."

EPA Response: This claim appears to refer to the letter of Feb. 23, 1987, from C. Vita attached to the Comment; EPA had never seen this particular analysis prior to the Comment and could not have consulted it. However, in recent verbal discussion J-M has noted that it is a letter of Dec. 19, 1986, from C. Vita that is being referred to; EPA was never furnished a copy of this letter, either. Therefore, conclusions based on unknown calculations could not be considered by EPA.

Furthermore, EPA had performed its own analysis and found that the 18-inch cover design allowed considerably more penetrations per century than ten; the reason for the discrepancy in the two calculations is apparently the result of J-M's subtracting the estimated surface heave, as previously discussed.

f) J-M Claim: "A criterion with at least plausible substantive merit is the expected frequency of upfreezing to the surface over the long term, typically a 50- or 100-year design period."

EPA Response: Such a criterion would indeed be plausible if the "long-term" design period assumed by J-M were not too short. EPA has never quoted a 50-year period, and

even the 100-year period is misunderstood by J-M in this Comment; 100 years was selected by EPA as the basis for the frequency of frost penetrations, not the allowable period for asbestos to move through the cover! In the judgment of EPA, this latter period should be considerably longer than 100 years.

g) J-M Claim: "The thermal properties used by McGaw in the Addendum and those in the FS are different."

EPA Response: This is true. However, EPA's thermal parameters of Dec. 5, 1986, were furnished to J-M prior to their submittal of the revised FS. J-M did not incorporate them into the FS even though J-M had apparently received new calculations from C. Vita dated Dec. 18, 1986, which utilized these parameters.

h) J-M Claim: "Using updated parameters, the 18-inch proposal can be seen to be extraordinarily protective. Asbestos materials would not be expected to reach the surface for almost 700 years... The absolute lower bound estimate of breakthrough time for EPA's 24-inch proposal (with a six-inch sand layer) is 239 years, while that of the 18-inch proposal (with six inches of sand) is 222 years."

EPA Response: The years for upfreezing of asbestos referred to in the above claim are different from those

presented in the FS (greater by approximately 150 years), and apparently result from calculations which were not available to EPA at the time the Addendum to the FS was prepared. EPA has recently received these calculations from C. Vita and finds them to be based on assumptions of upfreezing rate that have not been validated by experiment or field experience. (Further response follows the next claim below.

i) J-M Claim: "Both designs (the 24-inch and the 18-inch) are predicted to assure virtually total reliability for a 100- and even a 200-year design horizon. Spending more money for a 24-inch cover cannot be justified on any principled basis using EPA's analysis. Accordingly, EPA should withdraw its flawed analysis and its 24-inch proposal."

EPA Response: J-M is in error when it claims total reliability based only upon calculations resulting from a theory of upfreezing rate which has not been proven. The theoretical model devised by C. Vita is no more than a first approximation of the physical processes that actually take place when a particle of asbestos is imbedded in a freezing soil. The model and its results have not been published in the open literature and evaluated by others against the state-of-the-art. Until this has occurred, and validating experiments or field measurements made, data resulting from use of the model

must be accepted as guideline only; a calculated degree of "reliability" is not the same as assurance that field results will be the same as those predicted by the model.

NOTE: EPA is charged with protection of the public health from the medical hazards of waste asbestos. EPA's analysis, and the requirement of 24 inches of soil cover based on this analysis, admittedly do not represent complete assurance that no future medical hazard will develop because of frost action. When so many unknowns are present because of assumptions made relative to climate, properties of soils, and mechanisms of frost heaving and particle migration, there is no way to assure complete and permanent protection. On the other hand, EPA's analysis relies on fewer assumptions and is a conservative application of an accepted and validated procedure for calculating frost penetration through soils. It is also an expedient approach which accepts a degree of risk balanced against the total cost, as is required by the governing regulations. J-M's own analysis shows that the EPA 24-inch cover thickness provides longer-term protection but costs only 10% more than the 18-inch cover proposed by J-M. For these reasons EPA cannot withdraw the 24-inch requirement.

j) J-M Claim: "EPA exaggerates potential impacts of the site by implying the waste-asbestos containing material that is currently encapsulated will soon break down and become friable due to the action of ground water, rain, sunlight, air, and wind. EPA provides no basis for this assertion

nor any scientific explanation of how it will occur... The asbestos-containing products manufactured at the site were explicitly designed to be used outdoors and to withstand exposures to weather... Chunks or particles reaching the surface will not become friable in any meaningful time frame."

EPA Response: J-M's assertions here are incorrect. The primary bonding agents used at the site are silicates and gypsum (cement) and asphalt. It is well-known that sunlight and moisture, and particularly freezing moisture, deteriorate these materials. The silicate agents are also highly alkaline and susceptible to chemical attack by acid rain and ground water. The products manufactured at the site were of course designed to be weather-resistant; nevertheless, they are not weather-proof, and deterioration to a friable condition will eventually occur. As for a "meaningful" time frame, the writer has observed cement-bonded asbestos board lying on the surface at other sites in such a rotted condition that any disturbance would cause the apparent structure to vanish; yet these scraps had been exposed on the surface for no more than 2 to 5 years. It is also quite possible that a significant degree of this structural breakdown had occurred during the upfreezing period, even before exposure to air and sunlight.

CONCLUSION

In the Introduction to the Comments discussed above, J-M states that they strongly disagree with the conclusion of EPA's Addendum to the Final Feasibility Study, i.e., to continue to recommend a 24-inch cover over the asbestos material at the Waukegan plant site. The reasons given are that EPA's decision rule for cover thickness is without basis, and its supporting analysis is both flawed and inconsistent.

J-M clearly believes that an 18-inch cover appropriately maintained is fully adequate to address conditions at the site, and that EPA's 24-inch requirement should be withdrawn. They base this belief on the results of a computer model of upfreezing rate which appears to demonstrate that even with an 18-inch cover thickness of frost-susceptible soil, asbestos could not reach the surface for almost 700 years.

The approach J-M's consultant (C. Vita) has developed for estimating the time it will take for asbestos to reach the surface is a good one, and if validation demonstrates that it produces correct results for various types of soils and climates, it may become part of the basis for future asbestos cover designs. Unfortunately for the present project, it represents an unproven procedure that shows some deviation from the standard EPA requirements, but this deviation cannot be relied on at the present stage of development. The reason is that we are dealing with an issue of public health, which requires a conservative solution.

Because the J-M procedure has no precedent, it is possible that the computer results could have shown that a 30-inch or greater cover was needed for maintaining the asbestos below the surface for the first 100 years. In that case, it is probable that the EPA results would have been acceptable to J-M because the cost would have been less.

And that is the ultimate argument; because the EPA procedure, however overdesigned it may be (if at all), is a state-of-the-art process it gives a greater final assurance against failure of the cover. It is believed that the responses given above to J-M's claims demonstrate that fact. For this basic reason the 24-inch cover thickness for the Waukegan site must be held to by EPA.

Richard W. McGaw, P.E.

Richard W. McGaw, P.E.

APPENDIX B

COMMENTER	AFFILIATION
Grover Alexander 200 South Utica Street Waukegan, IL 60085	Resident
Frank Angeles (No Address Given)	Resident
Ken Bardo 3010 Grand Avenue Waukegan, IL 60085	Solid Waste Specialist Lake County Health Department
Henry J. Bogdala, Sr. 1601 Alexander Street Waukegan, IL 60085	Resident
Sara S. Clark Marjorie Sennholtz	League of Women Voters - Lake County League of Women Voters Waukegan-Zion
John L. Hoff 2531 Poplar Street Waukegan, IL 60087	Resident
Steven P. Kaiser 1405 North Avenue #403 Waukegan, IL 60085	Resident
Ed Koranda 2020 Elim Zion, IL 60099	Zion Environmental Concerns Committee
Manville Corporation c/o Kirkland & Ellis 200 East Randolph Drive Chicago, IL 60601	Site Owner/Operator
James W. Middleton 203 Greenwood Avenue Waukegan, IL 60085	Financial Sec'y and Business Rep. Int'l Chemical Workers Union Local No. 60
Stanley L. Proroic 907 S. Jackson Street Waukegan, IL 60085	Resident

APPENDIX C

WRITTEN COMMENTS

37/113

RECEIVED

FEB 12

LAKE COUNTY HEALTH DEPARTMENT

LCHD

Division of Environmental Health

February 11, 1987

Margaret McCue, SPA-14
Attn: Johns-Manville Public Comment
U.S. EPA Region V
230 S. Dearborn St.
Chicago, IL 60604

Dear Ms. McCue:

Thank you for the prompt notification and various reports on the remedial action plan at the Johns-Manville Site, Waukegan, Illinois. The investigations and public hearing were very informative.

The Lake County Health Department supports the USEPA and IEPA recommended alternative involving the placement of a 24" final cover over the asbestos waste. This action is most suitable based on the waste type and pathway for dispersal into the atmosphere.

Our Department currently monitors groundwater at closed and active landfills because much of Lake County utilize underground aquifers as a water source. We would appreciate copies of the groundwater monitoring results proposed for the Johns-Manville facility.

If you need our assistance at this site or others in Lake County, please contact me.

Sincerely,

Ken Bardo

Ken Bardo
Solid Waste Specialist

KB:ldm

sent to:
Bradley
Johnson
Niebergall
[illegible]
2/12/87

38/113

INTERNATIONAL CHEMICAL WORKERS UNION, LOCAL NO. 60
AFL-CIO
203 GREENWOOD AVENUE • WAUKEGAN, ILL. 60085 • 312-662-6003

JIM FRANCIS
President

JAMES W MIDDLETON
Financial Sec'y & Business Representative
5

February 10, 1987

Ms. Margaret McCue
Community Relations Board
115 EPA - Region 5
2305 Dearborn Street
Chicago, Illinois 60604

Re: Manville dump

Dear Ms. McCue:

I have read the feasibility report regarding the coverage of the Manville waste dump in Waukegan. I thought the document very well written with excellent recommendations in it.

The recommendation of a dirt-fill containing vegetation, is one of your best suggestions. The thought here is that asbestos should not become air-borne, thus avoiding the first step of exposure.

Not only do I live in the 7th Ward, but I have an office the same Ward in which the site is located. Also, I am an employee of Manville and represent the workers in the bargaining unit at the plant.

I would appreciate your putting me on the mailing list from your office.

Sincerely,

James Middleton

James W. Middleton, Financial Secretary
and Business Representative

JWM:eab

Testimony to Remedial Alternative Proposal for Johns-Manville Site Clean-up

The League of Women Voters is filing this testimony in response to the Feasibility Study compiled by the Johns-Manville Corporation in order to evaluate the ways of resolving the contamination problems at its disposal site in Waukegan, Illinois. It is of the utmost importance that decisions involving waste management, including pollution control and clean-up, pay due regard to the wide-ranging social, economic and environmental consequences.
It is with this in mind that the League of Women Voters strongly supports alternative III as recommended by the U.S.EPA, which would require a soil covering of 24" with a final cover of vegetation.

We also support fencing along the east side of the site as an added protection to prevent anyone from wandering on to the site.

Along with the monitoring of the groundwater to ensure that the level of lead and other contaminants are detected should they increase, we believe there should continue to be periodic monitoring for airborne asbestos. This is the only way to ensure that the recommended remedial action, designed to eliminate the potential danger of airborne particulates, has been achieved.

In conclusion, the League of Women Voters is pleased to see that there is finally some concrete action proposed for the Johns-Manville site clean-up. We will be following the progress of this effort with keen interest.

Marjorie Gennholtz

Waukegan-Zion LWV

Sara S. Clark

Lake County LWV

Sara S. Clark

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To Call Writer Direct
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February 24, 1987

RECEIVED
FEB 26 1987

Via Federal Express

Ms. Margaret McCue, 5PA-14
U.S. Environmental Protection
Agency - Region V
230 South Dearborn Street
Chicago, Illinois 60604

ATTN: Johns-Manville Public Comment

Dear Ms. McCue:

Enclosed are comments from Manville Corporation regarding EPA's Addendum to the Final Feasibility Study at the Johns-Manville Waukegan, Illinois Disposal Site. They demonstrate that the 18-inch cover proposed in the original FS is both technically and legally appropriate for this site.

Please assure that these comments are properly incorporated into this docket and are considered in the drafting of EPA's final Record of Decision.

Sincerely yours,

John A. Zackrison

Counsel for Manville
Corporation

JAZ:jycs

Enclosure

42/113

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

In Re:

JOHNS-MANVILLE WAUKEGAN, ILLINOIS
DISPOSAL SITE

COMMENTS OF MANVILLE CORPORATION ON EPA'S ADDENDUM TO FINAL FEASIBILITY STUDY AND PROPOSED COVER THICKNESS

Marvin Clumpus, P.E.
Project Coordinator
MANVILLE SERVICE CORPORATION
Ken-Caryl Ranch
Denver, Colorado 80217
(303)978-2790

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COMMENTS OF MANVILLE CORPORATION ON EPA'S ADDENDUM TO FINAL FEASIBILITY STUDY AND PROPOSED COVER THICKNESS

INTRODUCTION

On January 28, 1987, the U.S. Environmental Protection Agency, Region V (EPA), submitted a five-page addendum to the Waukegan, Illinois Disposal Site Feasibility Study. In it EPA recommends a 24-inch thick cover for the site where the comprehensive Remedial Investigation/Feasibility Study (RI/FS) concluded that an 18-inch cover was appropriate. Manville strongly disagrees with the conclusion of EPA's Addendum. Using EPA's assumptions and parameters and its proposed cover profile, there is virtually no cognizable difference between EPA's 24-inch proposal and the 18-inch cover set forth in the Feasibility Study. EPA's decision rule for cover thickness is without basis and its supporting analysis is both flawed and inconsistent. Moreover, its purported information on asbestos health effects and environmental fate is misleading, incorrect and inflammatory.

For these reasons, Manville believes an 18-inch cover appropriately maintained is fully adequate to address conditions at this site; EPA's 24-inch proposal should be withdrawn. As demonstrated in the attached analysis, the cover design of the feasibility study is predicted to prevent asbestos from reaching the surface for almost 700 years, with 98.9 percent confidence that no asbestos could reach the

surface in the first 100 years. Changing the 18-inch cover profile to include a 6-inch sand layer would increase to 100 percent the probability that no asbestos would reach the surface in 100 years. Spending additional money for more cover thickness is simply unjustified.

SUMMARY OF RI/FS AND EPA'S ADDENDUM

On July 3, 1985, a Remedial Investigation was submitted to EPA and approved pursuant to a Consent Decree between EPA and Manville. It exhaustively presents data and information from investigations of the Manville Waukegan disposal site, together with detailed information about asbestos and the other substances of concern at the site. This RI was the product of about 15 months of intensive efforts, all performed in cooperation with EPA. The RI concluded that there was no evidence of off-site migration of hazardous substances, and that the off-site migration potential is low. Final Remedial Investigation Report, Johns-Manville Disposal Area, Waukegan, Illinois, Vol. I (July 1985) ("RI") at 1-4.

On-site, the RI found levels of chrysotile asbestos fibers in air samples that were slightly higher than background samples. RI at 4-30. However, there were almost no detectable quantities of fibers greater than 5 microns in length (id.), and no elevated levels of other types of asbestos fibers were found. Fibers in the 5 micron range and smaller

are generally not associated with adverse effects according to the RI.

Based on this RI, an FS was developed and submitted in December 1986 and approved by EPA in its letter of January 26, 1987. 1/ Because there is no evidence of off-site migration of contaminants, the remedial objective was determined to be to secure the on-site waste materials to eliminate or minimize direct contact and airborne dispersion pathways. A detailed analysis of a variety of remedial action alternatives was made, including an evaluation of several different cover thicknesses. This analysis included assessment of the potential for upfreezing through the cover. Based on this analysis, the FS report identified the 18-inch cover remedy as the cost effective alternative meeting the remedial objectives.

Following the issuance of this study, EPA submitted its five-page Addendum, together with a supporting report concerning upfreezing from a private consultant. These materials purport to justify a 24-inch cover, concluding that the "potential for failure . . . of the 18-inch cover is not acceptable . . . and that the additional health protection provided by the 24-inch cover . . . clearly justifies" expenditure of

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1/ Feasibility Study Report, Johns-Manville Disposal Area, Waukegan, Illinois (December 1986 -- revised) ("FS").

significant additional monies. The Addendum thus ignores the conclusion of the legally required RI/FS process. It also ignores the provisions of the only directly applicable EPA regulations -- the asbestos NESHAPS, 40 C.F.R. § 61.153, which would require only 6-inches of vegetated cover at this site.

EPA's Addendum and supporting documentation is inaccurate, inconsistent, misleading and unreliable. As shown below, it is based on a misleading and inflammatory description of asbestos health effects, and on unsupported statements concerning the potential environmental fate of the asbestos wastes at this site.

More significantly, the Addendum's upfreezing analysis is unreliable and unscientific. As noted below, it uses or relies upon shifting and inconsistent thermal parameters. It makes shifting and undocumented assumptions of questionable reliability. It makes many undocumented factual claims. Its analysis of freezing depth omits the impact of frost-heave. It fails explicitly to account for known variability in the parameters, and uncertainty concerning field conditions. Indeed, its use of the Modified Berggren equation, the fundamental analytical tool in the analysis, is irregular and marred by improper use of parameters (thermal conductivity values, latent heat values), and failure to correlate assumptions regarding parameters.

In short, EPA's Addendum on its face lacks scientific or technical credibility, validity and reliability as a basis for a 24-inch cover recommendation. But even if it were credible or valid, the justification it purports to provide for the 24-inch proposal lacks substantive merit -- when evaluated using consistent thermal assumptions, there is no substantial difference between the 18-inch and 24-inch proposal, especially when a common design profile is evaluated.

I. EPA'S ADDENDUM IDENTIFIES NO CREDIBLE OR MEANINGFUL DISTINCTION BETWEEN ITS PROPOSAL AND THAT IN THE FS.

EPA's analysis of the relative reliability of alternative cover designs begins with the announcement of a new reliability measure not previously considered in the FS or other materials. This new measure is the potential number of times asbestos materials might enter the cover in 100 years. According to the Addendum and support document, a cover should be designed to ensure that asbestos materials do not enter the covering layer more than 10 times per century (i.e., the frostline must not enter the waste deposits more than that frequency).

This criterion is completely arbitrary and almost meaningless. The Addendum provides no basis for the criterion, and no convincing basis could be identified. It clearly does not matter whether asbestos materials enter the covering layer -- as long as the materials remain covered, there could

be no public health consequences from movement into the cover. It is only the frequency or likelihood that materials might come to the surface within 100 years which is or can be important. 2/

That EPA's new-found criterion is crude, misguided and inappropriate is demonstrated by its use in the Addendum's support document. While it states that frost penetration to waste deposits 10 times per century is the appropriate goal. 3/ when it comes to analyzing the cover design in the FS, the document shifts to a criterion of only 5 (or no) frost penetrations per century (see p. 22). This more stringent criterion fortuitously results in a required cover thickness of 24 inches (at p. 26). Only when the cover design is changed to include a sand layer does the support document shift back to relying on ten frost penetrations per century as the objective (at p. 28).

2/ Given the present conditions at the site, under which there is virtually no potential public health impact, Manville doubts whether materials migrating to the surface pose a legitimate public health concern. But there can be no doubt that asbestos-containing materials within a cover pose no public health concern.

3/ McGaw, Richard W., Appendix, "Principles and Practice of Design of Soil Cover for Waste Asbestos in Northern Areas With Calculation of Minimum Cover in Open Areas of the Johns-Manville Asbestos Disposal Site at Waukegan, Illinois," (January 1987) ("Addendum Support Document"), at p. 8.

This inconsistency alone demonstrates the inappropriateness of the criterion. But even if it were appropriate, it would not eliminate the 18-inch proposal in the FS. Had EPA bothered to do the analysis (or even consult Manville's updated calculations), it would have discovered that the 18-inch cover design is estimated to permit excessive frost penetrations less than ten times per century, based on the thermal properties used by McGaw in his analysis. 4/ Thus, by EPA's own (albeit misguided) criterion, the 18-inch cover proposal in the FS is acceptable.

A criterion with at least plausible substantive merit is the expected frequency of upfreezing to the surface over the long term, typically a 50- or 100-year design period. EPA's Addendum does not make that analysis, but relies instead on the analyses presented in the FS. Unfortunately, the thermal properties used by McGaw in the Addendum and those in the FS are different, making any comparison of results a comparison of apples and oranges. When the FS analyses are updated using the thermal parameters relied on by EPA, there are no meaningful differences between the 18- and 24-inch proposals.

4/ See Letter from Charles L. Vita (Golder Associates) to Manville Service Corporation regarding "Cover Thickness to Remediate Airborne Asbestos in Disposal Site Open Areas Johns-Manville Waukegan, Illinois Plant" (Feb. 23, 1987) ("Attachment") at 3.

Using updated parameters, the 18-inch proposal can be seen to be extraordinarily protective. Asbestos materials would not be expected to reach the surface for almost 700 years. Moreover, the probability that the worst case asbestos containing materials (3-, 4-inch particles at the surface of the deposits) will reach the surface in less than 100 years is very high -- 98.9 percent.

The proposed 24-inch cover with six-inch sand layer is not significantly better by these standards. The expected time for breakthrough of this cover is stated by EPA to be approximately 500 years (though no analysis supports this conclusion). The Addendum's proposal, incorporating a six-inch sand layer in the profile, would increase to 100 percent the probability that breakthrough will not occur before 100 years. See Attachment at 6. But of course, incorporation of six inches of sand into the 18-inch cover proposed in the FS would do the same thing. A comparison of these proposals shows their differences to be truly trivial -- the absolute lower bound estimate of breakthrough time for EPA's 24-inch proposal (with a six inch sand layer) is 239 years, while that of the 18-inch proposal (with six inches of sand) is 222 years.

The minor difference between these proposals, potentially occurring after 200 years, is not meaningful. Both designs are predicted to assure virtually total reliability for a 100- and even a 200-year design horizon. Spending more money

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for a 24-inch cover cannot be justified on any principled basis using EPA's analysis. Accordingly, EPA should withdraw its flawed analysis and its 24-inch proposal.

II. THE ADDENDUM'S COMMENTS ON ASBESTOS HEALTH EFFECTS AND ENVIRONMENTAL FATE ARE MISLEADING, INFLAMMATORY AND PROVIDE NO BASIS FOR A 24-INCH COVER.

EPA attempts to justify its excessive cover size in its Addendum by restating and exaggerating the evidence concerning asbestos health effects. This restatement is inconsistent with the previously agreed upon description of health effects contained in the RI, and is overstated, misleading and inflammatory. Accordingly, it should be eliminated, or at a minimum modified to assure reasonable scientific accuracy.

EPA should not be permitted to impose onerous cleanup remedies on the basis of exaggerated and inflammatory health assessments. The facts are that in its present condition, the site's exposure potential and risk to human health are minimal and the site does not threaten surrounding environmental resources. RI at 5-15. In covered condition, the site will present virtually no risk, even if one assumes that some asbestos-containing particles might reach the surface of the cover in 100 years or more.

EPA first exaggerates potential impacts of the site by implying that the waste asbestos-containing material that is currently encapsulated will soon breakdown and become friable

due to the action of groundwater, rain, sunlight, air and wind. EPA provides no basis for this assertion nor any scientific explanation of how it will occur. It is implausible to suggest that these weathering processes will significantly or measurably increase the fiber release from the site. The asbestos-containing products manufactured at the site were explicitly designed to be used outdoors and to withstand exposures to weather. Asbestos was incorporated into these products partly to strengthen them and make them more resistant to weathering. Chunks or particles reaching the surface will not become friable in any meaningful time frame, if ever, and EPA's suggestions to the contrary are inflammatory and exaggerated.

EPA's restatement of the health evidence on asbestos is similarly littered with misleading and exaggerated statements that should be ignored. EPA's claim that "once asbestos enters the body, it remains there indefinitely" is misleading at best, and incorrect at worst. While residence time for amphibole type fibers is less certain, there is no dispute that chrysotile fibers dissolve and breakdown in the body, and are rapidly destroyed by acids. RI at 5-4, 5-5, 5-6. Chrysotile is the only type of asbestos found to potentially exceed background levels at this site.

Similarly, EPA makes the misleading claim that these fibers may migrate from the lungs to the "digestive tract, brain and sex organs." The claim is unnecessarily

inflammatory and misleading since there is no evidence that such migration, if it occurs, is associated with any adverse effects. Indeed, asbestos in the digestive tract has been repeatedly tested and found not to be associated with disease. This statement should thus have no bearing whatever on the cover design at the site and appears intended only to incite improper emotional responses in this situation.

Indeed, EPA's whole treatment of the disease-causing potential of asbestos exposure is inflammatory and misleading. It suggests that any exposure to asbestos is associated with a five-fold increase in asbestos disease. This claim wholly misstates the underlying evidence, which showed only that asbestos insulation workers with lifetime exposures to asbestos at very high levels had five-fold increases in disease.

Such exposures bear no relationship to conditions at the site. If there are exposures above background levels at the site, they are many, many times less than those experienced by insulation workers in a single day, and there is no one exposed to levels at the site for a lifetime. No one disagrees, moreover, that the incidence of asbestos-disease is dose dependent, with smaller doses being associated with lower disease incidence. The studies showing five-fold increases in disease are therefore totally inapplicable to conditions at the Waukegan site.

In short, despite its exaggerated and inflammatory tone, EPA's description of the health effects associated with asbestos provides no basis for a 24-inch cover. That description is exaggerated, misleading and totally inapplicable to conditions at the site. The site currently presents virtually no potential risk to human health. Any cover dimension will diminish, if not eliminate, that potential risk. Even if one assumed small quantities of asbestos-containing waste might reach the surface periodically, it would not change that conclusion, especially if that migration will not occur, if at all, before one hundred years after construction.

CONCLUSION

EPA's Addendum is unsupportive, technically unreliable and invalid, and inflammatory. It does not provide any significant basis for a thicker cover than that permitted in the FS for this site. Accordingly, an 18-inch cover should be installed at the site. Based on EPA's thermal assumptions, such a cover is predicted to be 98.9 percent reliable at preventing asbestos from reaching the surface in less than 100 years. Incorporation of six inches of sand into this 18-inch cover would make it completely reliable for a 200-year planning horizon. EPA's Addendum should, therefore, be rejected.

ATTACHMENT

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Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

February 23, 1987 Our ref: 863-2041

Manville Service Corporation
Ken-Caryl Ranch
P.O. Box 5108
Denver, Colorado 80217

ATTENTION: Mr. Marvin Clumpus, P.E.

RE: COVER THICKNESS TO REMEDIATE AIRBORNE ASBESTOS
IN DISPOSAL SITE OPEN AREAS
JOHNS-MANVILLE WAUKEGAN, ILLINOIS PLANT

Dear Mr. Clumpus:

This letter will clarify our cover thickness analysis, conducted for Manville Service Corporation. Selected parts of our work were referenced and critiqued in the USEPA January 28, 1987 "Addendum to Final Feasibility Study Report," (including attached Appendix) subtitled, "Required Minimum Cover Thickness To Remediate Airborne Contamination At The Johns-Manville Waukegan, Illinois Disposal Site."

This work addresses the issue of potential freeze/thaw movement of asbestos-containing particles, initially buried below the cover, eventually working their way onto the ground surface. The freeze/thaw phenomenon causing the movement is technically termed "upfreezing."

In this letter we present and document two important facts:

1. USEPA's disagreement with the 18-inch (one-layer) cover alternative proposed in the FS was not based on consistent assumptions or analysis; and that with consistent assumptions and analysis, estimated upfreezing protection from an 18-inch cover is substantially greater than USEPA has stated.

2. An 18-inch, two-layer cover, similar to the USEPA proposed profile, provides more upfreezing protection than USEPA's Alternatives (a), the same 100-year reliability (R100) as USEPA's Alternative (b), and is more cost-effective than either USEPA alternative.

The structure of this letter follows these two issues. We first clarify the USEPA critique of the 18-inch cover. Then, we discuss the 18-inch, two-layer cover.

18-INCH COVER: CLARIFICATION OF USEPA CRITIQUE

Manville and USEPA agree for the need to safely control potential or actual future upfreezing of asbestos-containing particles onto the exposed ground surface. However, important parts of USEPA's critique of the proposed 18-inch cover in the FS contain inconsistent assumptions.

In particular, USEPA used and critiqued our October 31, 1986 UPFREEZ5 computer model results (transmitted by letter of November 6, 1986), as included in the Feasibility Study (FS) Report of December 1986. However, the updated analysis results of December 18, 1986 (transmitted by letter of December 19, 1986) were neglected.

Our October 31 results were based on thermal inputs significantly more conservative than those subsequently used in the USEPA analysis, as reported in the January 28, 1987 USEPA FS-Addendum Appendix. We did not see or hear of the USEPA thermal input estimates until December 12, 1986, upon first receiving calculation sheets, dated December 5, 1986.

Our October 31 results predicted far less upfreezing protection than would be consistent with the USEPA thermal input estimates. Therefore, the December 18 updated estimates were specifically made to base our analysis on the same thermal parameter and boundary condition inputs as used in the USEPA analysis.

The following discussion sets the record straight regarding the 18-inch cover proposed in the FS and using updated estimates. The discussion also provides necessary backup to an 18-inch, two-layer cover analysis.

Updated 18-Inch Cover Analysis

The December 18 updated estimates were made to base our analysis on the same thermal parameter and boundary condition inputs as used in the USEPA analysis (Appendix, January 28, 1987 FS Report Addendum). In addition, the updated estimates were made to calculate cover upfreezing reliability (probability) for a 100-year period, following the December 16, 1986 USEPA/Manville meeting to discuss cover thickness requirements. In the meeting, USEPA focused on a 100-year reliability-based design. We consider this a rational and appropriate approach.

In a reliability-based cover design with a 100-year time horizon, the main measure of cover upfreezing performance becomes R100. R100 is defined as follows for this project:

R100 is the estimated reliability (probability) that upfreezing of "critically sized" (about three or four inches, as identified by USEPA) asbestos-containing particles initially at the worst-case location (top of waste pile or bottom of cover) will take 100 years or longer to reach the ground surface. Note R100 results must be conditional on the upfreezing analysis (hypotheses and assumptions).

For the same conditions used to compute R100, the probability of asbestos-containing particles reaching the ground surface in less than 100 years becomes: 100% - R100. In all cases, particles below the worst-case location (top of waste pile or bottom of cover) will take longer to reach the ground surface.

The December 18 updated estimates were based on our computer model UPFREEZ5Y and USEPA's thermal input (lambda, n-factor, and thermal conductivity) and critical particle size (3 or 4 inches). For the same 18-inch cover critiqued by USEPA, the updated estimates, including R100, were:

1. Average 681 years (not 79) for 3- or 4-inch particles initially at the worst-case location to first reach the ground surface, with a lower bound (average minus one standard deviation) of 343 years (not 71).

2. The cover would completely freeze an estimated once every 31 to 7 years or about 3 to 14 times in 100 years (9 times on average).

3. R100 = 98.9% (or estimated probability of 3- or 4-inch particles reaching the ground surface in less than 100 years equal to 1.1%).

These updated estimates for an 18-inch cover are more conservative (more upfreezing protection) than the estimates USEPA reportedly considers to represent a safe condition, as explained next.

USEPA stated that the 154-year lower bound October 31 estimate for a 24-inch cover "<u>does</u> appear to represent a safe condition" (Addendum, Appendix p. 29). The 154 years is based on an expected value (average) of 493 years, a coefficient of variation of 69%, and an absolute lower bound of 74 years, as the October 31 output in the FS Report shows. From these estimates the R100 can be readily calculated to be: R100 = 98.3%. Therefore, the updated estimates for the 18-inch cover exceed the 154-year lower bound (and associated R=98.3%) USEPA judged as safe.

ANALYSIS OF AN 18-INCH, TWO-LAYER COVER

At Manville's request, we analyzed the upfreezing performance of an 18-inch, two-layer cover described as follows:

Upper Layer: 12 inches of silty clay having strain (S) of 30% and heave fraction not recovered on thawing (F) of 0.3 (i.e., S=30% and F=0.3).

Lower Layer: 6 inches of NFS (non-frost-susceptible) sand having a conservative S = 3% and F = 0.3.

We understand this two-layer configuration would be implemented with standard grading and drainage design in the cover area and transitions, to provide and maintain effective grading and surface drainage to control ponding and generally enhance drainage of the cover soils. Vegetation of the cover surface would also be established wherever practical.

The 18-inch, two-layer cover upfreezing analysis extended our December 18 analysis. These analyses reflected the thermal properties and boundary conditions used in the USEPA thermal analysis. Cover upfreezing performance, including R100, was assessed based on thermal and upfreezing analysis, described as follows.

18-Inch, Two-Layer Cover Thermal Analysis

The December 18 results show the estimated thermal capacity of the upper 12-inch silty clay layer (S=30%) to be 667 F-Degree Days $\pm$ 14%. The estimated partial freezing index of the 6-inch sand layer was about 340 F-Degree Days $\pm$ 20% , assuming an unfrozen dry density of 110 pcf, S=3%, and consistent thermal property relationships.

Therefore, the 18-inch, two-layer cover has a total thermal capacity of about 1,000 F-Degree Days. This is thermally approximated by a 1.2-ft to 1.3-ft (15-inch), one-layer silty clay cover. The estimated return period for complete freezing of the cover is about 30 times in 100 years, on average.

We emphasize that the 18-inch, two-layer cover-effectiveness is not thermal capacity dependent. That is, R100 for the two-layer, 18-inch cover is not sensitive to thermal considerations. This is very important. The superior upfreezing control comes from the upfreezing characteristics of the sand layer, as reflected in R100 and discussed in the remainder of this letter.

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18-Inch, Two-Layer R100 (100-Year Reliability Estimate)

R100 for the 18-inch, two-layer cover is 100%. That is, with the assumed S and F values, the absolute lower bound for upfreezing of critically-sized particles exceeds 100 years.

The absolute lower bound (ABD in UPFREEZ5) is the most conservative estimate of years to upfreeze through the cover (more conservative than the lower bound) for given particle size, strain (S), heave fraction not recovered on thawing (R), and assuming the effective number of freeze/thaw cycles across the particle (C) does not exceed one per year. An absolute lower bound equal to or greater than 100 years requires R100 = 100%, regardless of cover thermal capacity or air/surface freezing conditions.

For the 18-inch, two-layer cover:

1. The estimated average or expected value for upfreezing would be about 960 years with a lower bound of about 545 years.

2. The estimated absolute lower bound for upfreezing is 222 years (185 years in the sand then 37 years in the silty clay).

3. Based on the absolute lower bound, R100 = 100%, regardless of the precise estimates for the lower bound and average. In fact, the conditional reliability would be 100% up to 222 years; i.e., RYrs = 100% for all "Yrs" equal to or less than 222 years.

R100 (and the absolute lower bound) are conditional on S and F. Taken as a pair, the S and F values assumed for the cover realistically support the conditional R100 = 100% estimate. First, F=0.3 is considered conservative because empirical upfreezing studies show F to be of order 0.1 for vertical motion (August 25, 1986 personal communication from Professor Bernard Hallet, Director of the Periglacial Laboratory at the University of Washington Quaternary Research Center). Second, S values for the two-layer cover are considered conservative for this site, as discussed next.

Sand Layer-Related Upfreezing Characteristics

Visual inspection and limited sampling and grain-size testing indicate the natural clean sands found on site are medium to fine sand with less than 1% passing the No. 200 sieve, classified SP by the Unified Soil Classification System and NFS (non-frost-susceptible) by the U.S.A. Corps of Engineers frost design criteria.

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If, as assumed, the cover sand layer is composed of these or similar sands, placed and maintained uncontaminated by fines, then strain, S, is expected to be 3% or less; very conceivably S will be zero because freezing can drive water out of clean sands (in open systems) where drainage can occur.

With effective use of standard grading and drainage design in the cover area and transitions, it is considered likely that site conditions below and laterally around the sands will allow drainage of the sand. This would include freezing-expelled water from the (clean) sands because of the relatively slow advance of the freeze front in the sand layer (insulated below the 12 inches of silty clay). The sand layer will also help provide (gravity) drainage to the silty clay. Further, because of limited capillarity, the sand will reduce frost heaving in the silty clay due to moisture migration from below the silty clay (i.e., from the waste pile or the sand itself). Under these conditions, a significant reduction in the strain (S) of the silty clay can be expected, because of the sand.

Therefore, with adequate grading and surface drainage to control ponding, an S=3% assumption for the sand layer and an S=30% assumption for the silty clay are considered conservative.

Comparison With USEPA Cover Alternatives

USEPA has recommended two 23.5-inch (rounded to 24-inch) cover alternatives for the site:

1. Alternative (a) -- a one-layer, 23.5-inch silty clay system; or

2. Alternative (b) -- a two-layer system with 17.5 inches of silty clay over 6 inches of NFS sand.

Alternative (a) is essentially identical to the one-layer, 18-inch cover proposed in the FS except it is 23.5 inches thick. The December 18 UPFREEZ5Y results (S=30% and F=0.3) can be used to assess the upfreezing performance of Alternative (a). These results show an absolute lower bound of 72 years and an R100 of 99.98% (interpolated). These are both less than the 18-inch, two-layer estimates.

Alternative (b) is similar to the 18-inch, two-layer alternative, but with the clay 5.5 inches thicker (from 12 to 17.5). Alternative (b) has an absolute lower bound of 239 years, 17 years more than the alternative. Both have R100 = 100%.

Therefore, a two-layer alternative provides more upfreezing protection than USEPA Alternative (a) and has the same R100 as USEPA Alternative (b). Furthermore, it is more cost-effective than either of the two EPA alternatives.

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Conclusion

Implemented and maintained using good design (as assumed here), the 18-inch, two-layer cover realistically supports R100 = 100% and, for practical purposes, can be expected to stop critically-sized particles from upfreezing to the ground surface. The 18-inch, two-layer cover alternative provides more upfreezing protection than USEPA Alternative (a) and the same R100 as USEPA Alternative (b), and it is more cost-effective than either USEPA alternative.

Finally, we note that any asbestos-containing particles more than a few feet below the bottom of cover (top of waste pile) will, in practical terms, never reach the ground surface due to upfreezing, regardless of cover design.

Sincerely,

GOLDER ASSOCIATES

Charles L. Vita, P.E.
Senior Project Manager

CLV/111/315

APPENDIX D

PUBLIC MEETING TRANSCRIPT

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Johns-Manville Superfund Site
Feasibility Study

PUBLIC MEETING
February 9, 1987
7 p.m.

Question & Answer Period
and
Public Comments

Moderator: Margaret McCue

PRESENT:

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Reported by: JACK ARTSTEIN & ASSOCIATES
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MR. BRADLEY: Manville and the USEPA agree that soil covering with vegetation is the appropriate alternative for the site. However, if you noticed, Kumar mentioned an eighteen inch cover thickness for the dry disposal areas, which are the areas outlined in red. And the soil profile that I put up which represents the USEPA recommended alternative is twenty-four inch thickness. The disagreement, as far as the cover thickness is concerned, centers on the difference in the cost-benefit analysis, which is the cost of achieving the abatement of public health threats and the cost of doing it, the cost of achieving that goal.

USEPA believes that a twenty-four inch soil cover alternative provides the appropriate level of protection to public health and the environment and also achieves all applicable federal and state standards, including the remedial response objectives of the Superfund Legislation and the provisions of the Superfund Amendments and the Authorization Act of 1986.

The last step regarding implementation of the remedial action, or the remedial alternative selected, is

that, depending on the results of negotiations between Manville and USEPA, is either Manville and USEPA will enter into a consent decree to perform the remedial design and remedial action as outlined in the record decision, or USEPA will implement a remedy themselves and recover costs.

And that concludes my presentation.

MS. MCCUE: Thank you, Brad.

One other item I'd like to mention is that in addition to the record of the decisions that outline what actually will be done at the site, taking into account public comments. The document is a responsiveness summary where we identify what all the comments were and how it how it was managed. So, as part of the record of decision, there is a joint document that talks about the kind of comments.

What I would like to do now is address any questions that you might have. All those different people I introduced at the beginning of the meeting are also available to answer questions if any of your questions happen to fall into the area of their expertise I expect that they will be glad to answer most of your questions.

Does anybody have any questions?

Q. What kind of timetable are we looking at, as far as something being done as far as negotiations?

MS. MCCUE: Do you mean a timetable for how long the negotiations will take, or when something will start, or a timetable for how long something will take once it's started?

Q. Yeah. I'd assume that the recommendation probably couldn't start until there was a consesus and agreement on both sides. Is that correct? Or no?

MR. BRADLEY: Well, as I mentioned the negotiations will either end in agreement or the USEPA will clean up themselves.

Q. Okay.

MR. BRADLEY: However, there is a general timeframe for completing negotiations, so we do have a general feel for when we will begin work, or when Manville will begin work.

Q. Any idea as to when the work will begin? Either that or the completion?

MS. MCCUE: I'm going to have--Larry Johnson is our attorney. He is responsible for the negotiations. He may know better than anybody.

MR. JOHNSON: Under the Superfund Amendments Act of 1986 there is essentially a two part trade within which we can negotiate. There is an initial sixty day period where you send a special notice to the parties which you feel, the USEPA feels, are responsible for the cleanup. They have, after receiving that notice, they have sixty days in which to send a proposal to the USEPA for implementing cleanup activities. Then there is a second sixty day period, after the proposal, during which negotiations take place. And at the end of that second sixty day period, if no settlement, then we would get a consent decree, then the USEPA proceeds without an agreement into the cleanup phase. In other words, there is that timetable as far as negotiations.

Q. So, it could be 120 days?

MR. JOHNSON: Well, there is already, the special notice letter has already been sent. At this point I'd say that some time in May total 120 day period is up.

MS. MCCUE: So, that gives you some timeframe. Of course, a decree is a court document, it won't necessarily be, but it actually is lodged in court.

MR. JOHNSON: A consent decree is a document that a judge signs that reflects the agreement between the USEPA and the court.

MR. MALHOTRA: Let me add that suppposing that by May that thing is settled, and both parties agree, then after that take four to five months to prepare plans and specifications of what has to be done, and that will be in say October or November. Then you bid the job with thirty days to six weeks to get the contractors' response, and sometime in December or January you receive the bids. Then another thirty days or two weeks time, somewhere in February you award the contract. Then in '88 sometime depending the season the contractor will be ready to start the work. So, basically '88 and '89 will go into --

Q. Right. So we'd be looking at fourteen, maybe fifteen months?

MR. MALHOTRA: Well, essentially it would be two seasons, because, you know, they are not only grading

and that, it's a very large area. You're talking 120 acres over there. And that's a large amount of dirt. You're talking 300,000 cubic yards of dirt, so you're not talking just a small quantity of dirt to be moved. Depending on what -- and so we're looking at essentially two years here to complete that. If we move that surface dirt in the early part of '88, so early part of--late '89 or the early part of '90 it would be done.

MS. MCCUE: Gentleman in the back.

Q. If I understand correctly, you agreed upon number three. The EPA and Johns-Manville agreed upon number three?

MS. MCCUE: Well, I have a hard, I have a little bit of a hard time, what I'm trying to say is, there is no signed agreement.

Q. There is no signed agreement, but you both have agreed number three would be it?

MS. MCCUE: That's what we're recommending.

Q. All right. That costs FOUR MILLION FOUR HUNDRED EIGHTY EIGHT THOUSAND ($4,488,000.00) DOLLARS. Is a short term project, or short term security, according to

this document I'm reading here because of the fact it refers us back to number two. See, before the FOUR MILLION FOUR HUNDRED EIGHTY EIGHT THOUSAND ($4,488,000.00) DOLLARS is spent, either by EPA or by Johns-Manville, who takes care of the rest?

MS. MCCUE: I'm not sure I understand your question. Are you saying that we said that that alternative was only a short term solution?

Q. According to this document it's only short.

MS. MCCUE: I don't think that's what--I'm not sure where you got that.

Q. In the long-term, top soil erosion is likely, increasing the potential for direct contact with the contaminants.

MR. BRADLEY: Are you looking at alternative II versus alternative III?

Q. No. I'm looking at number three, but it refers back to number two on the long-term--

MS. MCCUE: Okay. Well, it's not actually--I can see where you got that idea now. It wasn't the intention. I think one of the--

Q. Well, that's what it says.

MS. MCCUE: One of the differences between two and three is the long-term effectiveness. And that's why the thickness of the cover. I don't have my fact sheet here so I can't read it. That's not what we meant, if that's what it said.

Q. Well, that's what it said.

MS. MCCUE: Well, that may be what it says, but I'm telling you, that's not what we meant by that. So--

Q. Okay.

MR. MALHOTRA: (Referring to the projection from the overhead machine) Two and three are clear, long-term prognosis--no for grading and seeding, and number three is yes. So, that's it. So two is not acceptable.

Q. So then, if you read your own document, and read number three, it refers back to number two.

MR. MALHOTRA: Well, I didn't prepare it.

MCCUE: Yeah. He didn't prepare it. He's not guilty of that.

Q. I think if you read the last sentence of the last paragraph, it's pretty clear.

MS. MCCUE: I think it says short-term adverse impacts are similar to those in alternative II. That's the only thing that I see that refers back to alternative II. And that says short-term adverse impacts, that would be the, you know, the stirring up some soil while actually putting the cover into place. I don't see anything that says about long-term. If there is a sentence that says that, I don't see it. If your concern is for long-term effectiveness, one of the reasons that we're recommending this alternative is because it would have a long-term effectiveness. That's why number two is not--

Q. (Another speaker) That's what I was concerned about--

MS. MCCUE: Excuse me, could you speak up?

Q. I say, that's what I was concerned about too.

MS. MCCUE: Was the long-term effectiveness?

Q. Some of these people from the corporation have already mentioned keeping up, have said something about thirty years. After that, they'll drop out of site and leave it up to the taxpayers.

MS. MCCUE: Well, Larry, (regarding Mr. Johnson) maybe you would want to address--two things, maybe if you would want to make that an official comment we would be happy to take that as a comment. But, I think, perhaps, Larry, could you address that in a decree, what you can, a court document, that there are requirements put in there so that people don't drop out of sight.

MR. JOHNSON: Well, the decree, if there is a consent decree out and a judge signs it, it doesn't die. It remains a court order. It remains enforcible by USEPA. I'm not sure I understand your--I'm not sure I'm addressing your concerns properly. Is that--what I'm saying is, if there was a, if the USEPA entered into an agreement with Manville Sales Corporation, and a judge signed a consent decree reflecting that agreement, that consent decree is a court order and it doesn't die. I don't know if I'm addressing the problem that you're--

Q. May I just ask the question again, Larry? I think he's asking--you said something about thirty years, or someone mentioned monitoring regularly for thirty years. What happens after thirty years?

MR. BRADLEY: Okay. What I said was a minimum of thirty years. What would be done, is that it would be done for thirty years, and then the need to do that would be reevaluated and would continue as the need exists for more monitoring.

MS. MCCUE: Okay. A couple of things, I'd like to suggest to you that if you want to make your concern about there being something to take care of the long haul as a comment, either out loud or written, that would be more than acceptable. You two are really, not you, first in the vest and then the man in the jacket.

Q. Okay. Part of this concern was, you know, if you have Johns-Manville, or now Manville Sales as one of the parties to the agreement, I mean, they just reorganized under Chapter 11, or whatever they did. I mean, assume they have more problems again, is it going to be local taxpayers who would end up footing the bill, or you

say the USEPA is going to come in with Superfund money, and they are going to take care of it regardless of Manville's cooperation, or who are we looking to foot the bill of this cleanup, assuming there is no consent decree and Manville--

MR. JOHNSON: All right. This site is on the National Priorities List. It's a Federal Superfund Site. Either, under Superfund, the law, either as a general rule, the party responsible for the site pays to clean it up in an agreement with the USEPA, or the USEPA can clean it up itself and then sue the responsible party to recover all of its costs. The EPA does that. The EPA uses Federal Superfund money for the cleanup and then seeks to recover that cost from the party responsible for the site.

Q. So then the estimated cost here, some 4.5 million for project number three, soil covering with vegetation, if in fact it exceeds that, and is say six million or whatever, that's USEPA that is going to pick up the cost--

MR. JOHNSON: No. If there is a consent agreement, or a consent decree that's reached--if there is an agreement reached, the cleanup is going to be performed

per this design outline that you have seen here. It is not going to be, "Well, we've reached 4.4 million. Now we quit and turn over--."

MS. MCCUE: Regardless of cost, it has to--

MR. JOHNSON: Regardless of cost, you have to meet design criteria and finish it.

MS. MCCUE: Same with us. If the USEPA were paying for it. We pay for what it takes to accomplish the cleanup in the requisition. The costs often change. You're right. They often change.

I'm sorry. The man in the suit jacket had his hand up first, and then you. I'm sorry. Go ahead.

Q. First of all, I would like to ask, what health hazards are we facing here that we know of definitely?

MS. MCCUE: Well, I think that Brad can add to this, but if you're talking about immediate, today, the investigation found that the airborne asbestos is on the site, not off the site. So, our concern--and the specific contaminants in the groundwater didn't violate any drinking water standards now. So, we're not talking about an

immediate health threat. We're talking about preventing one from happening.

Q. Yes. So, we're not sure though, are we? The comment, statement, that I would like to make, I appeal as a citizen of the United States of America that the U.S. Environmental Protection Agency and the Illinois Environmental Protection Agency get together once and for all and develop standards of levels. Because I know by reading U.S. Environmental paraphenalia that they do have standards of levels and the Illinois State EPA does not. I wish that the two would mesh together.

The next point is that we're talking about four-and-a-half million today. Two years from now we don't know what that four-and-a-half million will be. I appeal to the United States Environmental Protection Agency to work with all haste on this, because there is a possibility that this could be a health hazard.

Secondly, I agree with this gentleman here, (referring to an audience member who had previously spoken) I don't think this is a solution that is going to be a lasting solution. And we're all not going to be here

thirty, forty years from now, but our grandchildren will be. And I think we owe the future Americans something here, and I think we all have to work a little harder. But, I think Johns-Manville has to look at its commitment to the area. And I think that the Superfund that I have heard so much about for years, just never wants to spend any money.

MS. MCCUE: Okay. Much of what you are saying, I think, really falls within the perview of comment. And if you would like that, all of what you just said to be part of the public record, then I encourage you to fill out one of these blue cards (referring to a comment card).

Q. I already have.

MS. MCCUE: Okay. Is this it? (Holding up one particular card.)

Q. Yes.

MS. MCCUE: Is this your--

Q. Well, I don't know, I can't see that far.

MS. MCCUE: Oh. You can't read that? (Laughing)

Q. Must be.

MS. MCCUE: Henry is your first name?

Q. That's it.

MS. MCCUE: If you want that, what you just said to be your comment, I can have the court reporter mark that as an exhibit.

Q. I certainly would, yes.

MS. MCCUE: Okay. Why don't we do that. Umm, there were three parts to what you said, and normally we don't respond to comments and I think Brad is itching here to say a couple of things about it, but we will still consider what you say as comments.

Q. Well, I would like them to be considered.

MR. BRADLEY: Well, I apologize if I didn't clarify this, but as far as the long-term actions to be taken, again what we found in the remedial investigation is the need to abate the asbestos air emissions on-site. The cover thickness of twenty-four inches will provide at least one hundred years of protection before any of that asbestos will ever reach the surface and become releasable. And I also mentioned that a cover monitoring program would be developed to ensure that none of the asbestos, does ever reach the surface and become releasable.

An example of something that could be done, as far as a cover monitoring program, would be to take soil borings, at a specified period of time, say every two, three to five years, and check it for asbestos. And if asbestos is found to be close to the surface, then more cover would be placed down to ensure that it never does reach the surface.

Secondly, the remedial investigation indicated the need to take proper remedial action if the lead, and to a lesser extent chrome, in the soils becomes mobile and moves through the groundwater. The protection monitoring system was established to detect whether the different contaminants do become mobile, and that would continue for a minimum of thirty years, at which point the need for that would be reevaluated. So, it is a minimum of thirty years, and if the need still exists, then it would continue. So, it is a long term solution.

MR. MCGALL: Mr. Bradley, may I answer--or Margaret, could I answer one of the--

MS. MCCUE: Okay. One thing, I don't want anyone who is making comments to feel that we are in any way disputing their comment. That is not our point. That is

why we usually have the comments come at the end. So, don't look on--look on it as a clarification, not argument.

MR. MCGALL: Let me answer the end of your comment, about the EPA not having spent very much money on this subject. I am Dick McGall, and I am a consulting engineer as far as the mechanics and the costs. We're now working with Region V and the Illinois area in general. And a much larger area, actually. Well, I have been working for three years with the Region Office in New England. And you may have read in the newspapers that around Nashua, New Hampshire there are a great many deposits of asbestos. In that case, it happened to be in residential areas. Nashua and Hudson across the river is the fastest growing community in New England. People from Boston moving north across the New Hampshire border live in this area.

Well, three years ago, Superfund money was spent, for the last three years has been spent on, well, more than one hundred sites have been identified, and perhaps twenty in the three years have been restored. And the average cost is somewhere between TWO HUNDRED THOUSAND ($200,000.00) and THREE HUNDRED THOUSAND ($300,000.00)

DOLLARS per site, not in all. So, there is probably TEN MILLION ($10,000,000.00) DOLLARS, at least, in Superfund money spent on covering waste asbestos in that area. And, some of that experience is what we are bringing here to this area. Superfund in this area is just beginning to do that. Actually it has been working for some time, it is just now that the money is becoming available. But it has been spent elsewhere.

Q. May I ask one last question: Is there any money earmarked by the United States Government right now, Superfund, for this just being passed? Is there actually any earmarked for it?

MS. MCCUE: I'm not positive, to tell you the truth. I think that we could check for you. I don't actually know. I can check.

There are a couple of people who--I'm sorry, you in the jacket.

Q. Well, my big concern is--

MS. MCCUE: Is this going to be a comment, or is this going to be a question?

Q. This is going to be a question.

MS. MCCUE: The only reason I'm saying that is because I don't like us to get into a lot of argument about your comments, and that's why I would just as soon have all comments. If you have a question, that's fine.

Q. Well, I think I have a very sensible question.

MS. MCCUE: Well, then, that's good.

Q. We've got a harbor full of PCBs, and that is still there. They're going to start a new project a half a mile up the road. Why don't you combine the both of them and take the stuff out of the harbor and use it in the big holes up there, and fill it in and that takes care of all of it at once.

MS. MCCUE: Well--

Q. I mean, it all makes sense. You're talking about billions of dollars. They're going to have to haul in all this fill.

MS. MCCUE: I'm not sure that Manville and the OMC necessarily want to get together on that project. They are really two separate projects entirely. And, as you all know, the harbor project has had its own problems. And

I think that we would all just as soon move ahead on the Manville project.

Q. Have there tests been taken in there west of the tracks of the Northwestern track there, have you checked for anything coming from that old city dump there?

MS. MCCUE: Ummm--

Q. Is there any chance of contamination of groundwater from there?

MS. MCCUE: That may be the Health Department. Is that the one that was called the Municipal Landfill, or whatever?

Q. It was the city dump for a good many years.

MS. MCCUE: I know that there is a former landfill that is being scored for the National Priorities List, but I'm not sure if that is the one that you're talking about.

Q. Well, it's just west of the Northwestern track. It was filled in all the way up to the hill when it was the city dump.

MS. MCCUE: Is anybody from the city (Soliciting a response from any city personnel who may be in the audience.)

Q. It was city controlled.

MS. MCCUE: I don't know the answer to your question.

Q. And then they moved out there, I think on Lewis Avenue. They filled in there and there's an awful--where that housing project moved in--and there's an awful lot of leakage coming out of there. You can't get into that creek out there--

MS. MCCUE: Okay. The creek I know is one that the USEPA has what we call an initial site investigation, to see whether there is even a need to score it and put it on the National Priorities List, which Larry was talking about. I know that that site is under review for the possibility of being added to the National Priorities List. It's still under review. There also is a landfill site here that is in the same status, I'm just not sure whether it's the one that you are talking about.

Q. There's over there. Then also there's the possibility of water coming down through, they call it the Glum Florida Canal, or something, they come down there where all that fertilizer has been sitting out in the fields. And that all comes down into the Mammal Canal here.

MS. MCCUE: Well, I know that at least for a couple of those the USEPA is already working. And the others, I think I saw Kurt (referring to Mr. Neibergall) making a note of. Typically what happens is that a local agency or Illinois EPA looks these places over and refers them on to the USEPA. It is very unusual for us to be first ones to look at something. A couple of them I know we know about, and I noticed Kurt making notes about the others.

Q. (New speaker) I would like to make a statement, but I have three questions too.

MS. MCCUE: Well, ask your three questions, and then we will do your comment.

Q. Well, first of all, does anyone have any idea what the history of the site that Johns-Manville is located on was prior to its acquisition. I'm trying to see what would it take us back to get it back to a natural

state? The second thing is how would if affect the park, or the Illinois State Beach Park we have out there, as far as, since it is bordering on that line. Is it possible--what would be the ramifications of this landfill? And then the third part is, after we do spend the millions of dollars on this thing here, would that still be Johns-Manville property? Because I foresee--those questions have been on my mind because I'm going to say, if we are going to spend the money, I don't think it should become Manville property, and I don't think they should be dumping their garbage on that thing anymore, and besides, if it is fixed up, and we spend all the money on it, it should become an integral part of the park itself.

MS. MCCUE: Okay, sir, so it sounds like you have three questions and we may end up with three different people to answer them. The final one, on will the property stay Johns-Man--Manville Sales we will let Larry answer that one third.

MR. JOHNSON: (Stood up.)

MS. MCCUE: I was going to save that one for last.

MR. JOHNSON: Okay. (Sat down.)

MS. MCCUE: How it's going to affect the state park--are you saying how would the cleanup affect the park?

Q. Well, really the cleanup, the drainage, and all of this other--

MS. MCCUE: Oh. Okay. And then, the first one, I think what you're really asking is could the site be restored to the way it was before there was any industrial use of it.

Q. Yes.

MS. MCCUE: Probably a very good question. I think--

Q. Did Manville steal the land from the lake?

MS. MCCUE: Can you deal with the restoration and affect on the park?

Q. (Another speaker.) I'm sorry to interrupt, but I can go as far back as 1922. I was working there when they first started putting that up.

MS. MCCUE: So, you're saying that you do know what the property looked like before?

Q. Yes. It looked just like what it is to the north of there.

MS. MCCUE: Like the park?

Q. Yeah. But you got a ditch coming out from the west going right on around Johns-Manville. That was put there since 1922.

Q. (Another speaker.) I go back that far too, 1922, because my dad moved down here from Milwaukee with the Manville organization. And what was done there, sand was pumped out from the lakefront there into the buildings to build up around the foundations. That land, when they first started to build it, was just like the park.

MS. MCCUE: Okay. But the question was, could the site be restored to the way it was, as you people know how it was.

MR. BRADLELY: I'll address that. I think what you're referring to is actually removing what's there, which is not a recommended alternative. Kumar went into that. That would be similar to the off-site landfilling

alternative. The idea, it's asbestos, which is carcenogenic and very hazardous in the air, is not to move it or disturb it and allow it to become releasable to the air.

Q. Excuse me. Wasn't there the issue of whether Manville would retain ownership of the property?

MS. MCCUE: Well, that's what we're going to have Larry talk about that. Why don't we do your second part though, which is if there is going to be any effect on the state park.

MR. BRADLEY: As described, the recommended alternative won't have any effect, as far as construction activity, on the state park. What it will do is ensure that no asbestos is released to the air after the cleanup. But it will--that's separate property and there will be nothing done there.

Q. (Another speaker.) I have a question.

MS. MCCUE: Could we finish up--

Q. Well, could I ask you what he just--

MS. MCCUE: Oh. Okay. Follow-up.

Q. Let me get this straight. Am I to understand now that there is no asbestos airborne off-site?

MS. MCCUE: That we found in the investigation.

Q. I beg your pardon?

MS. MCCUE: That we found during the investigation.

Q. There is no asbestos off-site? Airborne?

MS. MCCUE: That we found during our investigation. During the times that the site was being investigated there was none found.

Q. You mean, there is nothing blowing anyplace from that site?

MS. MCCUE: We are not saying nothing is ever blowing from there. What we have said is that during the times the site was investigated we found none leaving the site. But, I don't think that anybody is going to guarantee that nothing is being blown off.

Q. So, it could be a health hazard after all, couldn't it?

MS. MCCUE: Well--

MR. MALHOTRA: Let me clarify that. Let me clarify this. There have been three air samplings done at

this site. Two were done prior to, well all three were done prior to when I got involved. Two were done, one by EPA, and the third was done by a consultant from Canada, a well known company hired by Johns-Manville. The first two studies indicated that the levels of asbestos in the air were slightly higher than in the off-site locations. But those were still in the range of what you find in the industrial areas. They were slightly higher on-site. There is asbestos in the air all the time. And there is asbestos in the water as there is in the water all over the country, all over the place. The inspection of what concentrations are higher and what concentrations are lower. So, typically by example the water which you are drinking in Waukegan, right, taken from the Waukegan ground has six to eight million, you know, fibers per liter of water. So, when you say about asbestos, you are talking about concentrations, that's why the United States agencies are set up with standards. So, the level on on-site locations, when they were monitored, was slightly higher than the off-site locations. And the intent here is to make sure that the levels in the air also are similar to or less than what we

are coming across at the off-site locations. That is all the purpose of the remedial investigation.

Q. May I ask another?

MS. MCCUE: Is this a follow-up to that, because we never finished this gentleman's--

Q. Yes. Now, you don't know that the asbestos that is coming off of that site is detrimental to anybody's health. Is that correct? Is that what you are saying?

MS. MCCUE: We didn't say that there is asbestos coming off the site.

Q. No. He did. (Referring to Mr. Malhotra)

MS. MCCUE: No, he did not.

Q. That it was higher than on-site.

MS. MCCUE: No, on-site slightly higher than off-site.

Q. Yes, but you can't really say no, either. Because we just had a northeast wind the other day that was about fifty mile an hour, and I bet my house toward the

dollar that you've got more asbestos in the air than you normally do.

Q. (Another speaker) If there is no airborne asbestos on the site, then what are you worried about?

MS. MCCUE: We didn't say that there was none on the site, we said--

Q. All right. Off the site then. I'm listening, but they are going around in circles as far as I'm concerned.

MS. MCCUE: I don't think so. I think it's really, it seems as though most other people have understood. Maybe we could talk to you a little more about it afterwards. But the essential point is that what is on-site is slightly higher than what is off-site. During the investigation we didn't find any off-site asbestos, beyond what is I think, as Kumar said, it "should be". But, this gentleman over here had a third question that I promised Larry would answer, and it had to do with ownership of the property after the cleanup. I think you are assuming if Manville

didn't clean it up themselves. If USEPA were to clean up the property.

MR. JOHNSON: Well, if we spend any government Superfund money to clean up this site, as I indicated before, we intend to recover all of that money that we spend from the responsible, the party responsible for dirtying up the site in the first place. So, initially, there is an outlay of tax money in cleaning up the site, but eventually it is recovered. As far as the land ownership is concerned, the land is currently owned by Manville Sales Corporation, as you know, and I also think it will--well, presumably it is still going to be owned by Manville afterward. They don't lose an ownership to the land because there has been a cleanup done there. All right?

MS. MCCUE: Well, it's not what he wants. (Indicating that the person who asked the question was not pleased with the response)

MR. JOHNSON: I'm not trying to tell him what he wants.

MS. MCCUE: I think he wants us to, if USEPA were to spend money in a place, that we get the property. I don't think we necessarily want the federal government to own--

Q. Well, my grandchildren are stuck with it.

MS. MCCUE: I think I understand your point, and I think that the answer is that, no, we don't seize the property.

The gentleman in the vest.

Q. Just kind of picking up on that, because it sounds like if it were covered, and seeded, and vegetated, it would be very beautiful down by the lake, but then you described the whole perimeter as going to be fenced in. Is that a safety precaution, or just something inherent in Manville's property rights? It's fenced in now, but--

MR. BRADLEY: The east boundary isn't fenced. That's part of the recommended alternative is to fence the east boundary. You could, a person could come on the beach and then walk up, go over some hilly areas, and onto the site. It is not presently fenced in. There will be areas still operating. The sludge disposal pit, and the

miscellaneous disposal pit, and the wastewater treatment systems will still be operating. And it, the fencing, is to limit access during the remedial action itself. And beyond that, it could be taken down.

MS. MCCUE: If that's a comment that you want to make on the record, then we would be happy to have that, but you are going to have to fill out one of these little blue cards.

Q. All right.

MS. MCCUE: But, that's the kind of thing we're looking for actually.

Q. Alternative III recommends eighteen inches of clay silt and six inches of sand cover over the waste area. I was wondering if you could regard what's involved in that, and what is the expected source of that material. Would that be coming from on-site or off-site?

MR. MALHOTRA: Off-site. Most of it would come--the same material that is on the north forty acres would be used for all of it. Again, any sand which is brought from off-site, or taken from on-site, will be tested first. The results would be given to the Illinois EPA,

USEPA. And once they have all determined that, yes, it is a suitable soil for cover, only then would it be used. But the intent is to take sandy soil for the six inch or nine inch, or whatever, cover underneath. We're talking sand from the Johns-Manville property and the heavier soils from off-site locations.

MR. BRADLEY: Yeah. I would clarify that as suitable as to non-asbestos containing. If it showed up positive for asbestos, it wouldn't be used.

MS. MCCUE: Do we know the cubic yards? Was that the second half? How much volume we are talking about?

Q. Yeah. The total acreage of the waste area when it's graded would be--

MR. MALHOTRA: Well, we are talking forty--we are talking maybe two, three hundred thousand cubic yards of total of material to be needed, depending upon what is the agreed to cover things--

MS. MCCUE: And then the acres. Do we know the acreage that would be covered?

MR. MALHOTRA: There are one hundred twenty acres and 57.3 acres is water surface, and the remaining,

let's say fifty/fifty, you can call it sixty-plus or sixty five acres is the area, surface area to be covered. The remaining is water surface and ponds.

MR. BRADLEY: With the exception of the sludge disposal pit and miscellaneous pit which would remain active. So, it would be less than sixty acres.

Q. From what I read here, it says contaminants were first discovered at the Johns-Manville disposal site in April of 1982 when air sampling conducted by the USEPA suggested there was airborne asbestos above background levels downwind of the site. Well, you know, that's all nice that that was done, tested and all. Certainly prior to 1982, maybe like 1945 that asbestos fiber was still there. So that 1982 is irrelevant to me. But, if I heard your attorney correctly, he said that monies spent by the US Government Superfund there would be recouperated. Correct? So, what's the hold up? Why don't we just get started on this thing.

MS. MCCUE: Well, first of all, we have to make a decision to do it. We have to take public comment and decide to do it. So, that is the step we're in now, if

that's what you're asking. As far as, you know, the time of 1945, or whatever, Superfund didn't go into effect until 1980--

Q. Well, I realize that. But, I mean, you know that the asbestos was there prior to--

MS. MCCUE: Oh, yeah. But, this is the starting of Superfund life, here, is where we tend to start our--

Q. (Another speaker) I would like to comment favorably on the orderly process that I see in action here. It's something that we want to do instantaneously but realize we have to go through an orderly process. And that old what happened in '42 and '22 and no way are we going to be able to fix that.

MS. MCCUE: Do you want to write that down?

AUDIENCE: (General laughter.)

MS. MCCUE: Somebody called me to comment on the phone and they still had to fill out a little blue card.

MR. JOHNSON: Margaret, part of the reason for filling that out is because we need their names.

MS. MCCUE: Oh, absolutely. That's absolutely right. Please fill out the cards. Right here.

Q. (Another speaker.) In the recommended alternative, there is a statement here that says it also provides some protection to groundwater. What does that protection, how is the groundwater protected if the waste is on the bottom, and if the sand and clay and so-on go on the top, then how is the groundwater protected if the waste is down on the bottom?

MR. BRADLEY: Okay. What's happening there is that rain and other precipitation would infiltrate through that cover and potentially, if the conditions are right, I don't want to go into too much detail as to what the right conditions are, potentially it can remove the contaminants from the waste pile and settle into a solution, at which point they would move with the groundwater. Not necessarily as fast as the groundwater, but would become mobile in the groundwater. And what the remedial alternative, the recommended alternative does--

First of all, the remedial investigation did not show any levels of contaminants that were greater than the applicable drinking water standards. And so, there have been drinking water standards right now, and what we are trying to ensure in the level of protection that you are asking about is that these levels of contaminants do not exceed drinking water standards, or any other applicable standards adopted in the future. And the detection monitoring system, which I described, where the eight, the minimum of eight additional wells would be installed, we would put that into effect. That would be monitored at a given time interval for a minimum of thirty years, and if any concentrations show up that pose a threat to public health and the environment based on these existing standards or criteria, then proper remedial action would be taken.

MS. MCCUE: Pretty much--

Q. The monitoring system is the protection?

MS. MCCUE: Well, actually I reread that sentence. Pretty much the cap always protects groundwater because it prevents anymore rain or snow from pushing down the contaminants further into the groundwater. There are

sites where the groundwater is the biggest problem and we put a cap on a site to protect the groundwater from pretty much pushing further, so I think that is, in part, what it was referring to. Because it says protecting it from lead, and we wouldn't want the lead--

Q. Heavy metals.

MS. MCCUE: Right. So, the cap would prevent the chance for contaminants getting pushed further down.

MR. MCGALL: Margaret, there are different types of caps. If you cap a landfill using a very heavy clay, the water does not percolate through. Simply to keep it impervious from precipitation on the surface. In this case, we're trying--we will have to maintain a vegetative cover, in which case we need the air and water migrating through some soil. So, in this case we are using soils, even the heavier silty clay, will actually have a percolation through them. And so in this case there is the danger that clay and sand and the vegetation on them will leach the material out, put it in the groundwater, and as the attorney has mentioned, the groundwater is going to Lake Michigan, and so it eventually gets to the lake and it will

deposit on beaches and dry up and blow away again. So it's a possible source of new asbestos, the asbestos in groundwater, or other hazardous metals.

MS. MCCUE: Our fact sheet does say, however, that the cap will provide some--

MR. MCGALL: It provides some, but this is not the same cap that the landfill would be, it's not that tight.

MS. MCCUE: Does that answer your question, or have we--

MR. BRADLEY: Any cover will, to some extent, retard percolation. Any cover. As Dick mentioned, the ones, heavier soils greater clay compacted, for example, will do a greater job retarding the percolation than sand, which water flows through rapidly. So, it does offer a degree of groundwater contamination, just by being a soil cover--

MS. MCCUE: Protection.

MR. BRADLEY: Oh, protection. So, just the fact that it is a cover does work to retard groundwater contamination.

Q. You are retarding basically the heavy metals and not the asbestos. That's the problem.

MR. BRADLEY: That's correct, and--in the groundwater that is correct. And again I don't want to go into too much detail, it could get really complicated as far as how metals move in the groundwater. But asbestos, because of its fibrous nature does not tend to move through the groundwater, and therefore is not such a concern at this site, through the groundwater. They are very concerned with the air, but not the groundwater.

MS. MCCUE: Do you have another?

Q. Well, how is that related? The fibrous that you've got in the water here, compared to what you've got in Lake Superior, where you've got a lot of this asbestos in suspension. If you've got it in suspension in one part of the lake, you should have some kind of a suspension here in Lake Michigan too. Or am I hearing? I'm talking about what they have up at the far west end of Lake Superior.

MS. MCCUE: Duluth?

MR. BRADLEY: Duluth.

MS. MCCUE: Is your question actually whether the asbestos suspended in the lake is a problem?

Q. Well, if you have a suspension problem in Lake Superior, you've still got water here, the same thing could have applied there.

MR. MALHOTRA: No, not really. What is hapening is in that from the reserve mining in Duluth, in that area, what they are doing is they are taking iron ore, grinding that, you know, taking the ore, and the rock which has also iron ore, also has asbestos. When they were grinding and then through settling systems they were settling the iron ore, pulverizing and making steel, and the remaining liquid and ground rock they were dumping back into Lake Superior. And through that reserve mining they had pumped millions and millions of tons of broken asbestos and rock, in suspension, dumped into Lake Superior, and that's why the levels of suspended asbestos have gone up in Lake Superior.

Here, we are not taking, if we were taking Johns-Manville waste from here and pulverizing and the product was going into Lake Michigan, then I could see some similar effects showing up here. Here they are all being piled. The only suspension would be the levels, and weekly they are counting them. Also, the amount of asbestos which is present here is in the bound form. This is a waste product like asbestos cement pipe people are using for drinking water. So, it is all tied up. Or asbestos shingles, or sheeting materials--so they are broken or off standard, those are the ones which are dumped there. So these are more tight as opposed to broken and suspended and dumped there. Here they are all cemented and glued together and so they are not easily releasable. Not only to the groundwater, but also less releasable to the air also. So, there is a difference.

Q. So these are not in suspension.

MS. MCCUE: I'm glad he knew. Umm, we'll take one more question and then what I would like to do is check on the status of people who want to make comments and make sure we're able to do that.

Q. Could I ask him on that off-site sampling? About fifteen or twenty years ago we sampled all the way, the whole perimeter of the plant, many times. And the counts that we got at the fence were much lower than what they were on-site, in the dump. Then we also took samples up on top of the hill, on Sheridan Road, on some people's property. I have a son and a grandson that live up there on Sheridan Road, and I'm not concerned with them at all, as far as asbestos.

MS. MCCUE: We being Manville?

Q. Well, I'm retired.

MS. MCCUE: No, I mean when you said we sampled fifteen years ago.

Q. Well, yeah. I was working at that time for Johns-Manville and I've been retired now for six years.

MS. MCCUE: Thank you. What I would like to do is to check to see whether anybody--

MR. BRADLEY: Do you want to get his name?

MR. MALHOTRA: Do you want to identify your name, address, or--

Q. Frank Angeles.

MR. MALHOTRA: I mean, to fill out a card.

MS. MCCUE: What I would like to do is to see whether there is anybody who wants to make a comment who has them, has something that they want to tell us about what we are recommending or the other alternatives, or what we should consider in making a final decision. Is there anybody who would want to take that chance?

AUDIENCE: (No response.)

MS. MCCUE: If there aren't, I would like to ask that those people, a couple gentlemen, and a couple of other people who said things during the course--I think you did too--course of the question period, that you would like to have what you said made a public comment, I would encourage you to fill out a card so that we can make that a part of the official record and it can be given every consideration while we are making a final decision.

Uh-huh?

Q. Can I still ask one more question?

MS. MCCUE: Okay.

Q. As to the water, the Sanitary District, they are supposed to filter this water too, aren't they?

MR. MALHOTRA: The what?

MR. BRADLEY: Filtration?

MR. MALHOTRA: Yeah, they have to--

Q. (Another speaker.) No, just sewer water.

MS. MCCUE: What's your question?

Q. If there is any asbestos in the water, then the Sanitary District should catch it all.

MS. MCCUE: Oh. Okay. I see what you're saying. So, you're saying that it's treated before it reaches..

Q. The plant itself is not sending any water to the Sanitary--Sewer District. Only water from drinking water. All their processed water goes out to the settling basin.

MS. MCCUE: So, you're saying. Oh. Okay. Well, the gentleman is talking about groundwater that might become contaminated and get into the water supply. But, I

think the city water supply comes from way out into the lake.

MR. MALHOTRA: The City of Waukegan has an intake which goes to almost three or four miles inside the lake. And, see the asbestos fibers, there are two kinds. One of several lengths. So, the EPA has come up with a recommended maximum level only of fibers that are longer than certain lengths, more than ten microns. So, none of the water contains any of the fibers which are longer than that. And they allow up to seven million, 7.1 million fibers per liter you can have and that is safe, not threatening. But neither Waukegan water, nor any of the water which was tested during this, had fibers which were longer than that or of that, of any concentration. So, of fibers are present which could be threatening, or which could have harmful effects, those fibers, the longer fibers, were not present. And your Waukegan plant does take the drinking water, treat it, filter it, you know. But that type of filtration normally does not remove the fibers.

MS. MCCUE: Any other questions or comments? We will be happy to stick around and answer any individual

questions that people have. If you go home and think about this and want to submit written comments, we are accepting them postmarked until February 24th. Everyone who is here who is signed up on our sign-up sheet will be added to our mailing list and will be notified as to the next steps being taken in the process. Thank you very much for your participation.